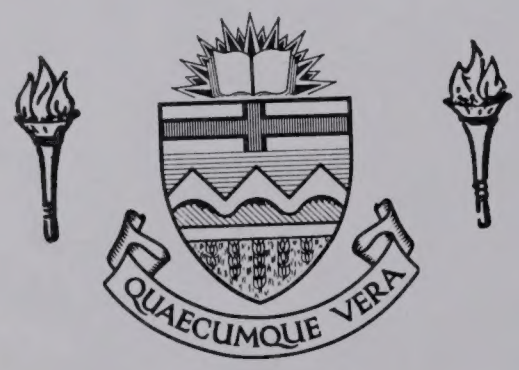

The University of Alberta
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FACTORS AFFECTING ECONOMIC GROWTH IN THE BONNYVILLE REGION

by

 ELMER C. ALLEN

A THESIS
SUBMITTED TO THE FACULTY OF GRADUATE STUDIES
IN PARTIAL FULFILLMENT OF THE REQUIREMENT
FOR THE DEGREE OF MASTER OF SCIENCE

DEPARTMENT OF AGRICULTURAL ECONOMICS
EDMONTON, ALBERTA
AUGUST 1967

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The undersigned certify they have read and recommend to the Faculty of Graduate Studies for acceptance a thesis entitled "Factors Affecting Economic Growth in the Bonnyville Region," submitted by Elmer C. Allen, in partial fulfillment of the requirements for the degree of Master of Science.

ABSTRACT

Many agricultural areas in Canada have low farm incomes relative to other higher income agricultural areas. This is partly due to the rapid agriculture change taking place today. Slow economic growth is usually attributed to inferior quality and smaller quantities of physical resources per worker. Adoption of new technology, farming practices and large capital investment in the more affluent agriculture regions has served to increase the difference in income between farms and regions.

In this study, two regions were selected in Alberta. Factors which contributed to economic growth in the high-income Red Deer area were isolated and compared with those in the low-income Bonnyville area. It was found that Bonnyville farmers had low incomes because inadequate amounts of resources were available to combine with the existing labor force. Furthermore the low-income region did not use existing resources efficiently. With improved management, more efficient use of resources, and increase in the farm size a considerable increase in the agricultural region's economic goals could be achieved.

It is unlikely that a more favorable growth rate can be achieved without stimulation from outside the region. This is were ARDA and other resource development programs can play a big role in improving the low-income problem of rural regions.

ACKNOWLEDGMENTS

The writer wishes to express sincere thanks to his supervisor, Dr. T.W. Manning, for his assistance and guidance in the completion of this study. The writer is also grateful to Dr. W.M. Schultz for his assistance and advice in many ways.

Special thanks are due to other members of the staff and graduate students for their constructive criticisms and the collection of the data.

The writer would also like to thank his wife, Joan, for her assistance in the completion of this study.

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CHAPTER I

INTRODUCTION

Many agricultural areas in the Province of Alberta fail to keep abreast of more prosperous agricultural areas or other more affluent sectors of the economy. Failure to increase productivity per worker and to maintain an adequate level of living has resulted in areas of rural poverty with high rates of underemployment and unemployment. It appears that farmers have failed to make the right kind or amount of agricultural adjustment in land usage, specialized operations, and larger or more extensive farming units to increase the rate of economic growth. As a result, the people living on these farms are experiencing a standard of living well below the provincial average. While certain economic forces have prevented poverty in one region, they appeared to have little effect in another. The purpose of this study was to determine why this is so.

The Problem

One problem in agriculture is that of low farm incomes. Agriculture is an industry wherein average per capita incomes are substantially lower than those of other sectors of society. However, the problem does not affect all farmers, bringing forth a second problem of more concern and creating the need for this study. Some regions have substantially low incomes while other regions have above average incomes.

Low-income regions called "pockets of poverty" seem to be more pronounced today than in the past. This is partly due to the rapid agricultural change taking place today. Farmers seek cost-cutting and increased production per farm operator by adopting new technology and more purchased inputs in an effort to increase their farm income. Increased productivity resulting from the substitution of capital for labor, technology, and economies of scale increase agricultural productivity per man. As a result, the tendency has been for the supply of agricultural products to outstrip the demand. Therefore, prices of farm products fall and the farmer's income is depressed.

Increased output per man results from each farmer's effort to increase production, and the increase is more rapid in some regions than in others. It appears that migration of labor from the farm and other adjustments in low income agricultural regions is not sufficient to maintain comparable incomes between agricultural regions. The adjustment in one region as compared to another has not been sufficient to bring all regions in the industry into reasonable economic balance. Imperfection in the market for factors of production must exist because marginal economic analysis suggests that unless there are obstacles to the move toward better opportunities, marginal income differences should not occur.

Since all farmers do not have low incomes the problem of a low income may be attributable to a low marginal physical product on certain farms. Low income may be caused by limited factors of production, a high ratio of labor to land and capital, or the lack of knowledge or even inability or unwillingness to move to better opportunities in other fields of occupation or better farming areas.

It is evident that a resource adjustment problem exists when resources in one region have low returns to employment when compared to high returns to employment elsewhere. Unless this adjustment problem is solved the income disparity may become worse, not only for the farmer in the region but for the whole rural community as well. Concern for these disadvantaged people supports the need to determine why economic growth has not occurred more rapidly in low-income agricultural regions. It is necessary to study economic growth and forces associated with it in order to solve the problem in these areas. The sources of differential rates of economic growth need to be determined by measuring and analysing the changes in the distribution of economic activity in the low-income region.

Objective

This study had two main objectives. The first objective was to determine why economic growth was impeded in a low-income agricultural region. The second objective, based on the results of the first objective was to determine how economic growth could be promoted in a low-income agricultural region.

The first objective required determination of factors associated with economic growth and measurement of their relationships to growth. It also required a review of the amount of agricultural adjustment and changes in factors of production which have affected economic growth over time. The second objective, like the first, was based on investigation of the affects of resource use, technology and other factors which together might raise the areas per capita income to levels comparable with other regions of the economy.

Procedure

Sources of Data

Most of the data were gathered during the summer of 1965 in a random sample survey conducted in two areas of the province. The field survey provided information on the production, sources of income, quality and quantity of resources, and characteristics of the operator and his operation. Additional information was obtained from secondary sources including the Census of Canada, published and unpublished material, and through correspondence. Secondary data were useful in studying economic growth over a period of years. This data included changes in productivity, resource use, factors of production, population, and structural changes such as numbers and size of farms.

Other data, such as soil conditions, weather, and climate also were gathered in both regions. Factors from outside the region which might affect agricultural development were not considered. More attention was concentrated on land, labor, capital, management, and other characteristics of the areas generally relevant to economic growth.

Method of Analysis

Two areas were selected for study. One area was a high-income agricultural area, the other was a low-income area with a similar type of agriculture, having a low rate of economic growth. The former region was selected to provide some indication of how resources were used, the rate of economic growth achieved, and the agriculture adjustment made over time in a successful area. With this background, a comparison between regions was made to determine the differences in progress and the potential for growth in the low-income area. Comparisons were made

to Alberta or other parts of the province wherever required to justify certain aspects of economic growth.

Information from both areas was analyzed and compared with the intent of isolating any important variables associated with the economic growth of the two areas. Attention was paid to factors presently associated with the development of the high-income area and not present in the low-income area. Factors that appeared to be associated with higher incomes in the low-income area also were isolated in an effort to determine a resource adjustment required to achieve efficiency and a higher rate of economic growth.

CHAPTER II

CONCEPTUAL FRAMEWORK

An explanation of the factors affecting economic growth in an agricultural region was needed but first it was necessary to define economic growth in regional terms. Also, some measure of the rate of regional growth was necessary. The rate of growth achieved in a region is associated with the various economic factors of production. The major problem was to select the more significant factors influencing economic growth. Factors commonly associated with economic growth were selected and compared in the agricultural regions studied. With these findings it was then possible to determine the changes necessary for more rapid agricultural growth in the low income regions.

Economic Growth Defined

Economic growth can be defined as an increase in a region's capacity to produce goods, services and leisure.[1] Increasing the productive capacity or production of a region through development of productive resources could still leave some resources such as available labor underemployed with low incomes. This implies that policies for full factor utilization must be developed. Economic growth refers to an increase in the output of the region. However, with proper utilization of factors it is possible to increase the output per worker, through optimum allocation of resources between regions without increasing the total output within the region.

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[1]Karl Brandt, "Total Economic Growth in Agriculture," Adjustments in Agriculture - A National Base Book. Edited by C.F. Christian, Iowa State University Press, 1961, pp. 22-53.

Most national growth concepts are concerned with increasing the total output of the economy. This study will not deal with concepts of national growth but with increasing regional output and increasing the output per worker in the region. Furthermore, the distinction between changes in output due to shifts in the production possibility frontier or movement to the frontier by fuller utilization of resources will not be carried out due to measurement problems.[1]

Measuring the Economic Growth of a Region

Current performance of a region may be calculated through output, employment, increased output per capita, real income per capita, the amount of leisure and the stability of output. Due to the quantity of available data over time it was not possible in this study to measure all the changes in the region. Output per man-year would be a satisfactory measure of growth.[2] A better measure would be real income per capita per hour of work. This measure would allow for progress indicating the amount of leisure available and the increase in standard of living.

In this study gross income per farm operator was selected as one measure of growth because it was the only source of output data available. It would be difficult to convert gross income into real dollars so current dollars were used.[3]

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[1]R.G. Lipsey, "An Introduction to positive Economics," London, Wiedenfeld and Nicolson, 1966, p. 679.

[2]One man-year is equivalent to the amount of labor a man under the age of 50 is capable of producing during a period of one year. See Table XIV and XVIII for calculation of man-years.

[3]Current dollars will show the same relative affect as real dollars when the rates of growth are compared between two regions over the same time period.

Another indicator of economic growth used was gross regional output. Perloff and Dodds say it is necessary to measure both the output per capita and the output of the region because you could have no regional growth and yet due to a decrease in population an increase in output per capita is possible.[1] A satisfactory per capita income may be achieved by decreasing the population numbers in a low income region. This type of factor adjustment of population, and earning opportunities outside the region, could increase below average incomes in a region to levels received elsewhere. In contrast, it may not be necessary to decrease population numbers to attain growth if the productive resources in the low income region can be improved or replaced to create more output.

Factors Influencing the Economic Growth of an Agricultural Region

The problem of interregional disparities in growth and levels of income only recently has been given attention. A limited amount of work has been done on small regions within a country. Theories of economic growth more often concern underdeveloped and developed countries as a whole. As a result, a suitable method of analyzing regional economic growth remains to be determined.

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[1]H.S. Perloff with Vera W. Dodds "How a Region Grows: Area Development in the United States Economy," Committee for Economic Development, Supplementary Paper No. 17, March, 1963. They say: "A useful starting point is to make a distinction between changes associated with individual welfare and those associated with the volume of economic activities... The distinction between "welfare" measures and "volume" measures of growth is important because an area may have an increase in one without a corresponding increase in the other. In other words an area may have an increase in population without an increase in average real per capita income; or an area may have a decrease in the volume of economic activities and in population and yet enjoy an increase in average levels of living." (pp. 12 and 13).

Some factors directly act upon the variables contributing to production and as a result, indirectly influence economic growth. Therefore, it is necessary to observe the variables contributing to agricultural output and then determine the factors influencing the productivity of these variables as a whole. Confusion sets in when the characteristics of a certain variable are analyzed because there are factors which affect one variable and at the same time are interrelated with other variables.

The first problem then is to determine which variables affecting agricultural growth should be observed. This problem has been approached by Mary Megee who says that although it is impossible to observe the actual causes of growth if there are certain economic variables in the society it would follow that "growth might be explained in terms of the absence or presence of these economic variables in varying degrees."[1] Although this may seem to be a very simple approach there are a large number of economic variables in agricultural production to choose from. To keep this study simple only major economic variables were compared in the two regions. These were land, labor, capital and management generally.

Noneconomic as well as economic variables should actually be studied in growth analysis. However, as Bruton points out, the distinctions between economic and noneconomic variables over time are not too important because economic growth must be recognized as part of social evolution, not something that can be isolated from the social system and studied by itself.[2]

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[1]Mary Megee, "On Economic Growth and the Factor Analysis Method," Southern Economic Journal, Vol. 31, 1964-65, pp. 215-228

[2]H.J. Bruton, "Contemporary Theorizing on Economic Growth," Bert H. Hoselitz et al, Theories of Economic Growth, Glencoe, Illinois: Free Press, 1960, pp. 297-298.

The agricultural output of a region and the output per farm operator is directly related to the quantity and quality of the productive resources in the region. Factors which affect the quantity and quality of these productive resources (economic variables) are the factors that need to be observed. Factors which limit the amount of physical resources available such as land (cultivated versus uncultivated land, land in crops versus summer-fallow) need to be examined for the region and per farm operator. Likewise, factors which limit the amount of machinery and equipment, buildings, livestock and other inputs need to be observed for the region as a whole and the amount available per farm operator.

Factors which affect the quality of the resources employed such as capital and natural resources need to be determined. In most cases managerial ability will have a direct relationship with the quality of resources employed. Management for example is affected by the level of education, skill, attitude, and knowledge of the operator. Management in turn determines the use of technologically advanced farm inputs soil conservation and other improved farm practices and inputs. Furthermore each time new factors of production are employed resources must be reallocated to achieve more efficient use of resources in production.

In this study attention was focused primarily on those factors which affect the quality and quantity of land use, farming activities, livestock production, capital, family labor and management both in the region and per farm operator. In many cases it was difficult to determine the individual affect of each factor as many of the factors are interrelated - advancing technology and better management and skills for example go together; increased scale and specialization require agricultural adjustments and flexibility. Furthermore it was extremely difficult to separate

The importance and affect of any one factor from the complex and changing combination of variables which contributes to agricultural growth.

Increasing the Rate of Economic Growth

Considering land, labor, capital, and management as the four basic factors of production, an increase in regional production can be brought about in four ways:

(1) by adopting new factors of production called technology,

(2) by increasing the stock of available resources for production by either development of resources within the region or purchases from outside the region,

(3) by increasing the efficiency of resource use until the equilibrium combination is reached within the region,

(4) by increasing returns to scale (not necessarily brought about by technology but by factor proportionality).

In addition to the above four methods of increasing total output, an increase in per capita incomes can be achieved by:

(a) decreasing the number of underemployed workers in the region provided that better alternatives outside the region are available,

(b) an increase in price of product or decrease in cost of production.

The methods of increasing production (1, 2, 3, and 4) are by adjustments that are made within the region taking into account the type of market form. The fifth method (a) takes into account adjustments between regions. The sixth method (b) is a process which benefits the agricultural sector as a whole leaving relative positions of agricultural regions unchanged.

Adoption of Technology

"Technological change can be broadly defined as a change in the parameters of a production function, resulting directly from the use of new knowledge."[1] Schultz says, "the notion of a 'technological change' is in essence a consequence of either adding, or dropping, or changing at least one factor of production."[2] Increasing agricultural productivity by adoption of technology appears to be the key factor affecting economic growth and productivity as held by many growth economists.[3] Technology can transform the quality and mix of the four basic factors of production - land, labor, capital, and management which are the sources of permanent income streams into new and more productive factors of production. Once the factors of production concealed under technological change are determined the sources of economic growth can be analyzed. Slow growth in a region is caused by dependency upon a particular set of factors of production which have been exhausted. To increase agricultural output is to acquire, adopt, and learn how to use effectively a profitable new set of factors.

It is not easy to observe a new set of factors of production over time, because they can be concealed by technological change. An example of such a factor would be improvement in the quality of human and material inputs. Another difficulty in measuring the quantity of technology used in different regions is evident when it appears that two different regions

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[1]Thomas T. Stout and Vernon W. Ruttan, "Regional Patterns of Technological Change in American Agriculture," Journal of Farm Economics, Vol. 40, May 1958, p. 197.

[2]T.W. Schultz, "Transforming Traditional Agriculture," New Haven: Yale University Press, 1964, p. 133.

[3]Ibid., pp. 136-40.

are employing the same new factors of production, when in reality they are not. Although two factors may appear similar, the quality of the factors can be very different.[1] This can be observed in labor with varying management abilities, hybrid grains as compared to open pollenated grains, and in purebred livestock as compared to nonpurebred strains.

There is no mysterious nonconventional input called new technology.[2] Whenever technology changes the quality of a factor, the changed factor must be treated as a new factor of production. Some growth economists contribute all the increased output per unit of input over time to technological change when the increased output measured in per capita income could have come from any of the other five methods mentioned previously.[3]

A new factor of production may be more productive and profitable in one region than in another. Therefore, it may be advantageous for one region to adopt different factors of production than another region creating the additional problem of determining whether it is the presence or absence of a new factor of production which causes growth. To achieve growth requires the investment in new factors of production proven to be profitable.

Efficiency in Resource Use

An increase in agricultural production can be achieved by reallocating the factors of production within a region only if resources are not already employed efficiently. Once resources cannot be put to more productive

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[1]Zvi Griliches, "Measuring Inputs in Agriculture: A Critical Survey," Journal of Farm Economics, Vol. 42, December 1960, pp. 1411-1427.

[2]Thomas T. Stout, loc. cit., p. 198.

[3]Ibid., p. 198.

uses increased production (economic growth) can be brought about by adoption of new factors of production or bringing into the region more productive resources. This will necessitate reallocation of resources once more to maintain efficiency of resource use.

It is quite possible that low income regions are not using resources efficiently. To test production efficiency is difficult and involves a complex field of analysis. Heady says that:

> Difficulties are encountered, not only in making empirical estimates of the relevant physical cost and revenue relationships but also in delineating the relevant ends to be maximized and the proper choice indicators to serve as a basis for resource administration by farmers. To obtain some notion of whether production and resource use are organized efficiently, we must examine the possibilities of reshuffling resources (1) within single farms, (2) between farms of the same producing regions, (3) between producing regions, and (4) between agriculture and other industries.[1]

Under perfect competition the marginal factor cost of input should be equal to the marginal value product of output within and between regions. As long as the marginal returns are equal, resources are allocated optimally and, in terms of efficiency criteria, productivity of resources within or between regions is equal, regardless of the differences in quality of physical resources or its physical yielding ability.

In this study a Cobb-Douglass type of production function was selected to test if resources were being allocated efficiently within and between two regions. At the same time the production function provided indications of the possible returns to scale of operation which could occur if resources were employed in larger units.

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[1]E.O. Heady, "Economics of Agricultural Production and Resource Use," Englewood Cliffs, New Jersey: Prentice Hall, Inc., January 1965, p. 704 and 714.

Increasing Stock of Available Resources

Increasing agricultural output by employing more inputs leads to more output. Examples of resources that could be increased are; community pastures, irrigation, and arable land (by clearing and drainage) within the region. Capital goods, funds, and other productive inputs are resources that could be made available from outside the region.

Economies of Scale

An important part of agricultural output per unit of input may be derived from economies of scale.[1] This might be brought about by the removal of labor from agriculture, while the remaining farm operators practice more yield increasing techniques and thereby obtain a higher yield than those who left agriculture.[2] The removal of labor would permit farm consolidation which would present the opportunity for increasing output by employing larger machinery and not duplicating the machine units of those who relinquished the land. In many cases new factors of production would be employed yielding increasing returns.

Number of Workers in the Region

When marginal returns to labor are lower inside the region than they are outside, increased returns to both, the remaining labor force and the laborers leaving the region can be increased. Labor transferred out of the region increases the amount of available resources per worker

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[1]Zvi Griliches, loc. cit., p. 419.

[2]E.O. Heady, "Progress in Adjusting Agriculture to Economic Change," Journal of Farm Economics, Vol. 39, 1957, pp. 1336-47.

remaining in the agriculture region. Output per capita increases as a result of increases in the factors of production per worker.

Mechanical innovation has made it possible to transfer large quantities of labor from farm to nonfarm employment.[1] Although out-migration is necessary in low-income regions it alone will not solve the problem of underemployment, rather adjustments of agriculture resources and new capital investment are necessary.[2]

In this study increasing per capita output was treated as a migration problem rather than a resource allocation problem. However, both are similar in regional context but different when treated as a resource allocation problem within the region. That is, efficiency in resource use discussed earlier was primarily the concern of increasing regional output with resources available within the region only.

Inrease in Price or Decrease in Cost

Everytime there is a change in the price of output or cost of input, resource adjustments will be necessary. If regions are perfectly competitive marginal returns to factors of production would be equal between regions. Because factors of production may be fixed in the short run many adjustments would be slow.

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[1]Zvi Griliches, loc. cit., p. 419.

[2]C.E. Bishop, "The Rural Development Program and Underemployment in Agriculture," Journal of Farm Economics, XLII, December 1960, p. 1201. For more viewpoints see: W. Keith Burkett, "Effect of Nonfarm Employment on Agricultural Development," Journal of Farm Economics, Vol. 43, December 1961, pp. 1215-6, and, W.H. Nicholls, "The South's Low Income Rural Problem and Rural Development Programs," National Planning Association, February 1959.

Since gross income is directly related to prices, increases in output would have to be measured by holding prices constant. It was not possible to do this because prices were not available, rather physical production was compared between the regions studied.

Causes of Different Rates of Economic Growth Between Agricultural Regions

Complex forces cause regions to grow at different rates. Theoretically there need not be any difference in the rate of economic growth between agricultural regions, regardless of resource endowment and other elements of production, if the proper agricultural adjustment is made.[1] Imperfections exist in factor markets and in resource supply functions so that the marginal productivity theory breaks down between agriculture regions and between the agricultural and the non-agricultural sectors of the economy.

Difference in the per capita income and level of living between regions did not appear as pronounced when people pioneered and settled in new areas.[2] Per capita income increased more rapidly in some agriculture regions and in the non-agriculture sector as time passed. Differences in levels of living that occured over time may be consequences of the development of the economy and not fundamentally the result of any original difference in the cultural values or capabilities of the people themselves.

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[1]H.G. Dion, "Research for Agriculture Adjustment," Resources for Tomorrow, October 1961, p. 69.

[2]T.W. Schultz, "The Economic Organization of Agriculture," London: Cambridge University Press, 1963, p. 52.

It appears that there may be a tendency for low-income farmers to copy the farming methods and practices of higher income farmers in other regions as agriculture becomes more complex. The failure of the low-income farmer to realize that he likely requires a different type of adjustment may cause different growth rates. Regions with high farm income levels are imitated in farming practices and scale of operation. Due to the nature of resource endowment, among other factors, this may be one good reason why growth rates are different. Often it is not the physical quality of natural resources which determine the level of income attained, but the amount of capital investment, providing that the capital is invested to yield the highest possible marginal returns. Farmers with equal capital investment should receive approximately the same level of return on their investment. As Perloff and Nicholls discovered in individual studies, it is the amount of physical and human capital invested per man, regardless of occupation, which determines the income received.[1]

In studying underemployment in low-income areas it was found that very little capital was needed to become a low-income farmer.[2] Because there is no restriction on the entry of qualified wage workers into agricultural employment, the farmers with low equity capital receive very low incomes. However, in a region where high incomes are prevalent, capital requirements for entering farming are high, and low capital farmers do not enter into this region. As Hendrix noted underemployment was not associated with poor land but impediments to the entry of farm labor from

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[1]H.S. Perloff, loc. cit., p. 130, and W.H. Nicholls, loc. cit., p. 362.

[2]W.E. Hendrix, "Income Improvement Prospects in Low-Income Areas," Journal of Farm Economics, Vol. 41, pp. 1065-75.

low-income regions into non-farm employment and in the ease or difficulty, as the case may be, of its entry into agriculture.

The reason why net farm incomes might never be equal between regions with differing resource endowment such as soil fertility is because the optimum capital investment may differ between regions. Theoretically under conditions of perfect competition marginal returns to labor and investment should be equal between regions.[1] Since the economy is not perfectly competitive one region could have a much larger per capita investment than say the low income region. The low income region could attain an optimum amount of investment per capita such that larger amounts would yield negative returns. The high income region with larger investments would have a higher marginal labor return than the low income region. To equalize marginal labor returns the high income agricultural region would have to employ more labor but if they do not then the differences in net farm incomes will remain and they do.

Reasons why differences in per capita output occur between regions depend upon the following factors which affect their use to varying degrees.

(1) Adoption of technology: The rate at which farmers adopt technology is influenced by management ability, risk, uncertainty, lack of knowledge, technical application, and limitations of capital. Rapid technical advance can increase the rate of production and profits for the innovator. Farmers slow to adopt the new practices are eventually high cost producers who make a lower net farm income. Because technology increases total agriculture output, prices of farm commodities may drop. Farmers

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[1]Assuming that labor is equally productive in both regions having equal amounts of invested human capital.

that are high cost producers actually get left farther behind as the low cost producers widen the net farm income gaps and maintain a more rapid rate of economic growth.

(2) Efficiency in resource use: Low income indicating inefficient resource use is but one factor affecting economic growth as the farmers may lack the willingness to change to more profitable resource combinations. Bishop describes inefficient resource use as follows:

> In an efficiency context, the low income problem is one of adjustment in resource use - incomes from resources are increased by transferring resources to more productive uses - or of resource development. If resource owners are rational, the problem can arise and persist only (1) from lack of information concerning the potential return from resources in alternative uses or (2) as a result of governmental or other restrictions which prevent profitable resource transfers. Given imperfect knowledge or institutional restrictions on factor mobility, a large number of conditions can result in low incomes in one area relative to another. It should be emphasized, however, that inefficiency in resource use is neither a necessary nor sufficient condition for low incomes ... also relatively low returns do not necessarily indicate inefficient resource use.[1]

Farmers may not be using resources efficiently because of: (a) lack of farmer knowledge, management ability or investment in human agent enabling the individual to seek off-farm employment, (b) uncertainty and capital limitations, (c) low income and firm-household complex which prevent the acquisition of additional capital to achieve economies of scale, education, health, and training and skills. Sentiment for an inadequately operating farm unit also may prevent labor mobility.

(3) Increasing resource inputs: Farmers may not purchase sufficient factors of production from outside the region because of capital limitations or lack knowledge of factors of production that are profitable

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[1]C.E. Bishop, "Agriculture and Economic Development," Agricultural Experiment Station, Virginia, Bull. 556, July 1964.

such as fertilizer, chemicals, concentrates for livestock, vitamins and other inputs. Resources that remain idle within the region could also be affected by the same limitations mentioned above or because of institutional policies or lack of government and industry assistance to develop idle resources.

(4) Economies of Scale: Farmers may not be able to achieve economies of scale because of limited resources. Farm consolidation may require removal of underemployed labor out of agriculture in many cases. Even if labor is removed, the scattered distribution of small farms to be consolidated raises a problem. Because low-income farmers possess small amounts of capital and managerial skill, they may lack the resources to generate income to consolidate small farms.

Farmers may not desire to increase their operation or they are unaware of the increasing returns from size of operation. Management, risk, and uncertainty are probably the major factors involved limiting economies of scale especially if borrowing capital is necessary.

(5) Price of inputs and output: Factors affecting price of input and output are usually beyond the control of farmers who sell under perfect competition and buy under imperfect competition.

CHAPTER III

PHYSICAL DESCRIPTION AND POPULATION OF THE STUDY AREAS

An examination of the available physical resources was required to determine the agricultural potential in the study areas. Agricultural development achieved is partly related to the number of years agriculture has prevailed in the area and therefore the history of settlement will be reviewed. The change in per capita output over a period of time depends upon the amount of available resources per worker, so population changes will be compared between the two study areas.

Soil characteristics, weather, and climate will be examined as they may affect the amount of agricultural output and the rate of agricultural development. There are certain situations where soil or climatic conditions have no effect on economic development of agriculture. For example, differences in physical characteristics of land is not the cause of low farm income.[1] Chronically low farm production usually is not due to periodically adverse weather conditions, plant and livestock diseases or weed and insect infestations if they have been prevalent for an extended period of time.[2] Agricultural growth, however, can be affected if resources are depleted resulting from man's exploitation and lack of conservation practices.

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[1]T.W. Schultz, "The Economic Organization of Agriculture," 1953, and E.O. Heady "Economics of Agriculture Production and Resource Use" Prentice-Hall, Inc. Fifth printing January 1964, p. 753.

[2]"Opportunities for Economic Development in Low Production Farm Areas, A Study of Income, Employment and Resources," U.S. Department of Agriculture Information Bulletin No. 234, November, 1960.

Description of Study Areas

The Low-Income Area

The low-income agricultural area selected was the Bonnyville Municipality in Census Division 12, located in northeastern Alberta. This region was selected because Census Division 12 had the lowest income level of the 15 census divisions in the province. The Bonnyville Municipality contained some 542,713 acres in 1956 and nearly 600,000 acres in 1961.

Bonnyville is 165 miles northeast of Edmonton on Highway 28 and on the Edmonton-Grand Centre line of the Canadian National Railway, which was completed in 1928. Bus and truck transport also serve the area. Communication is provided by a weekly news paper, radio, television, Canadian National Telegraph, and the Alberta Government Telephone system. Rural electrification is provided by Canadian Utilities Limited.

The town of Bonnyville, incorporated in 1948 is the center of a trading area extending 25 miles to the north, 20 miles to the south and west and 30 miles east. This low-income agricultural area is served by the towns of Cold Lake and Grand Centre, both situated in the extreme northeast corner of the Bonnyville Municipal District. Although Bonnyville is the major trade centre, Cold Lake and Grand Centre also serve the area and all three provide some off-farm employment. A number of villages scattered throughout the district provide additional services and marketing facilities for the farmers.

The High-Income Area

The high-income area selected was the County of Red Deer in central Alberta. The county consisted of some 1,023,059 acres in 1959 and 1,014,013 acres in 1961. Because the area was much larger than the low-income area it was decided to survey the west portion of the county which contained 391,210 acres of farm land or about 36 percent of the total farm land in the county. The number of farms or sample size would then be more comparable to that of the Bonnyville Municipal District.

Red Deer County is situated in Census Division 8. The city of Red Deer, incorporated in 1913, is ideally situated in the centre of the county 93 miles north of Calgary and 98 miles south of Edmonton. The city is served by two railways and is located in the centre of a network of roads and paved highways leading to all parts of the province. The town of Innisfail, incorporated in 1903, and the villages of Sylvan Lake, Bowden, and Penhold (in decreasing size) are all located on the outer edge of the western portion of Red Deer County under study.

The early growth of villages and towns in the area was a result of the agriculture industry supporting the area. Oil and gas are now the predominant industries in the area. Refineries and large industrial plants are located within the city of Red Deer and surrounding area.

The increasing population in the urban area provides a market for livestock and poultry products. The proximity to agriculture markets in the area adds to the comparative agricultural advantage of this region over other regions. Higher prices for particular products and lower prices for certain inputs are reflected in higher value productivity for

agriculture in the more industrial regions.[1]

Climatic Conditions

Bonnyville Area

Climatic characteristics influence the economic activity of agriculture in Canada because of its northern location. Although the Bonnyville area is much further north than Red Deer and is in the northern climatic region, the relatively lower altitude, 1000 to 2000 feet less than the western Red Deer area, lessens the temperature differences. The mean summer temperature for Cold Lake, Elk Point and Lac La Biche for June, July, and August are approximately 56°, 62°, and 59°F respectively.[2] These temperatures are identical to those recorded in Penhold and Red Deer. The winters, however, are somewhat longer and colder in Bonnyville than in Red Deer. The growing season is short and frost damage is common. The long time mean frost free period ranges from 65 to 115 days in Elk Point and Lac La Biche respectively.[3] The frost free period is from the beginning of June to the middle of September restricting the area to grow short season crops such as barley and perennial grasses. However, relatively large quantities of wheat are grown.

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[1]Williams H. Nicholls, "Factors Affecting Gross Farm Income per Worker, Upper East Tennessee Valley," Journal of Farm Economics, XLII, (May, 1960), pp. 356-62.

[2]These figures are for 10 or more years of observation of mean daily temperatures as reported by, "Climatalogy Division," Meterological Branch, Toronto, Ontario.

[3]C.C. Boughner et al "Climatic Summaries for Selected Meteorological Stations in Canada", Vol. III, 1965. (The Elk Point figure is the average for 32 years and Lac La Biche for seven years of observation).

Bonnyville precipitation is generally adequate for the growth of fairly good crops. The average annual rainfall is between 12 and 13 inches, while the total precipitation is from 16 to 18 inches.[1] Rainfall records for 1959 to 1966 recorded in the town of Bonnyville from April to August inclusively, average 12.1 inches per growing season. Although total precipitation may be high, the inches of rain, the frequency, and the time of year of the greatest rain fall may be inadequate for good crops. Other factors such as transpiration, evaporation or perculation may also effect the availability of moisture.

Differences in soil composition also affect the adequacy of rainfall as well as nutrients available to the plant. Bonnyville grey wooded soils tend to be low in fertility, as the leaching process removes the soluble mineral plant food from the upper horizons. Soils low in organic matter require more rainfall than soils high in organic matter content. Poor crop yields result unless organic matter is increased by good rotational practices.

Western Red Deer Area

Red Deer County is about 140 miles south of the Bonnyville Municipal District. The altitude varies from about 3000 feet above sea level in the east to about 4000 feet in the west. As a result of the higher altitude the mean summer temperatures are similar to that of Bonnyville. For June, July, and August, the long time mean temperature was about 56°, 62°, and 59°F respectively.[2] The summers are longer with a correspondingly

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[1] Climatology Division, loc. cit.
Also see Appendix I Table I and II.

[2] C.C. Boughner et al loc. cit.
Also see Appendix Table II.

warmer winter than in Bonnyville. The wintering of livestock would require more work and more feed in the Bonnyville District. The Red Deer area also has a longer growing season than the Bonnyville District. The frost free period ranged from 79 to 111 days in Red Deer City for a 28 year average and 93 to 107 days at Penhold for a 13 year average between 1950 and 1964. The frost free period is shorter further west of the western Red Deer district although the average for the area would still be longer than in Bonnyville. There are less frost damaged crops in the Red Deer area, therefore, it is able to grow longer season crops than the Bonnyville District.

Precipitation is generally adequate for the growing of good crops. Total average precipitation is from 18 to 20 inches annually. While total precipitation is important, rainfall during the crop season is much more vital to growing crops. Although total precipitation is important in providing ample sub-moisture, a lot of precipitation during the winters is lost in the spring run-off. Rainfall during the growing season also is slightly higher for the Red Deer area with about 14 inches compared to Bonnyville with about 12 inches.

History of Settlement and Population

Bonnyville Area

The Bonnyville area was settled about 1900 which is more recent than the Red Deer area. By 1907 some one hundred homesteads were reported in the most fertile soil area, between Moose Lake and Ardmore. Most of the early settlers were French-Canadian from eastern Canada who were encouraged

to homestead by the Roman Catholic church.[1] The immigration of settlers from central and northern Europe was heavy prior to 1916 and between 1926 and 1936. Many settlers also came from the prairies in the 1930's. Some were forced by drought to buy or homestead on the fringe of settlements. By 1941 people of Eastern European descent comprised the largest ethnic group in Census Division 12.[2]

The peak of the farm population was reached around 1941 with the greatest increase occurring between 1926 and 1931 (Table 1, see figures under Sub-Divisions). Between 1941 and 1966 the farm population and number of farm operators decreased 50 per cent. Between 1941 and 1951 1000 farm people left the area and the total population of the Bonnyville area decreased. However, even as the farm population declined further between 1951 and 1966, the total Bonnyville population doubled because of the R.C.A.F. station at Cold Lake, Alberta. As the farm population decreased so did that of small hamlets reported as part of the rural population. Incorporated towns and villages on the other hand continued to increase throughout the period of investigation.

Red Deer Area

Settlement in the Red Deer area followed the building of the Calgary-Edmonton railway in 1890-92. Most of the land around Innisfail was taken up as homesteads by 1891 when the railroad reached Innisfail.[3]

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[1]B.J. Kristjanson and C.C. Spence "Land Settlement in Northeastern Alberta 1943," Pub. 800 Tech. Bull. 63, Dominion of Canada, Department of Agriculture, 1947.

[2]Ibid., p. 11.

[3]"Survey of Innisfail" by Industrial Development Branch, Department of Industry and Development, Government of Alberta.

TABLE 1

RURAL POPULATION AND NUMBER OF FARMS,
BONNYVILLE MUNICIPAL DISTRICT AND FOUR SUB-DIVISIONS,
ALBERTA, 1911-66

Year	Bonnyville Municipal District[a]					Sub-Divisions 572, 573, 601, and 602[b]			
	Total pop.	Incorporated towns & villages	Rural pop.	No. of farms	Pop. on farms	Total pop.	Rural pop.	No. of farms	Pop. on farms
1911	841	0	841	-	-	1,113	1,113	-	-
1921	2,515	0	2,515	-	-	2,849	2,849	651	-
1926	- -	0	-	-	-	3,191	3,191	731	-
1931	5,616	362	5,254	-	-	6,200	5,838	1,329	5,087
1936	-	432	-	-	-	8,004	7,572	1,723	-
1941	8,174	603	7,571	-	-	9,201	8,598	1,814	7,371
1946	-	726	-	-	-	8,512	7,786	1,489	6,405
1951	7,883	1,139	6,744	-	-	8,571	7,432	1,501	6,354
1956	12,964	2,906	10,058	1,133	5,112	13,970	11,064	1,246	5,623
1961	15,060	4,851	10,209	941	4,213	16,081	11,230	1,035	4,634
1966	16,325	5,502	10,823	-	-	17,407	11,905	-	-

Source: Census of Canada.

[a]The figures used for 1911-1964 are based on the revised 1956 Bonnyville M.D. Boundaries.

[b]The four sub-divisions which represent the Bonnyville area did not change their boundaries while in existance up to 1951. Figures were estimated for 1956-1966 to show the trend.

Business and professional men began arriving around the same time. Innisfail was incorporated as a town in 1903, some 45 years before Bonnyville was incorporated as a town. Homesteaders first settled along the eastern side of the railway where parkland vegetation was predominant.[1] At the turn of the century the eastern side was well settled and homesteaders moved west into the more forested area. The early settlement and establishment of agriculture in the region may be further illustrated by the formation of the first co-operative association for marketing livestock in 1908. Even as early as 1894, the first newspaper was established for the purpose of advertising land in the Red Deer area.

The total rural and urban population of western Red Deer was 3,872 by 1911 (Table 2). The first available count of the number of farms was 921 in 1921. Increase in the number of farms was gradual with the largest increase of 14 percent in the 1926-1931 period. In the midst of the Second World War, Red Deer and Bonnyville areas had the greatest number of farm operators. The number of farms decreased from a maximum of 1329 farms in 1941 to 1021 farms in 1961.

The total population of the area decreased from 1941 to 1946 as a result of a decreasing rural population. However, there was a substantial increase in total population from 1946 to 1961, and prior to 1941. The major increase in population occurred in the city of Red Deer and in incorporated towns and villages. Hamlets of 50 people or more have not decreased in size on the average as in the Bonnyville area.

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[1] T.W. Peters and W.E. Bowser, "Soil Survey of Rocky Mountain House Sheet," Alberta Soil Survey Report No. 19, Bulletin ss-1, University of Alberta.

TABLE 2

RURAL POPULATION AND NUMBER OF FARMS, RED DEER COUNTY AND SUB-DIVISION 341 AND 371

Year	Total pop.	City towns villages incorporated	Rural pop.	Number of farms	Total pop.	Towns villages incorporated	Rural pop.	Number of farms	Population on farms
	Red Deer County #55[a]				Western Red Deer or sub-division 341 and 371[b]				
1901	4,080	640	3,400	-	-	-	-	-	-
1911	11,894	3,296	8,598	-	3,872	482	3,390	N/A	-
1921	14,587	4,338	10,249	-	4,787	727	4,060	921	-
1926	-	-	-	-	5,325	849	4,476	1,081	-
1931	16,149	4,806	11,343	-	5,773	967	4,806	1,230	4,500
1936	-	-	-	-	6,815	1,286	5,529	1,292	-
1941	19,823	6,396	13,427	-	7,298	1,563	5,735	1,329	5,033
1946	-	-	-	-	6,949	1,943	5,006	1,191	4,302
1951	23,277	11,034	12,243	-	6,915	1,262[c]	5,653	1,194	5,001
1956	29,280	16,450	12,830	2,421	7,312	1,410	5,902	-	-
1961	38,160	24,683	13,477	2,310	8,017	1,818	6,199	1,021	-
1966	44,141	31,261	12,880	-	8,110	2,185	5,925	-	-

Source: Agriculture Census of Canada and Population Series 1.1-10.

[a]Boundaries as of 1956 Census.

[b]Western Red Deer area is of comparable size to sub-division 341 and 371 which did not change in area under investigation.

[c]North Red Deer Village was incorporated into the City of Red Deer in 1948 thus the decrease in village population.

Soil Characteristics

Bonnyville Area

A detailed soil survey of the total Bonnyville Municipal District is not available, however, some information for a block of 12 townships was published. The 12 townships for which a reconnaisance survey was made lie between Ardmore and Cold Lake.[1] Soil information was available for townships 60 to 63 inclusive, in ranges 1 to 6 inclusive, west of the 4th meridian.

The area is a relatively level plain with some rolling land and predominantly covered with aspen poplar tree cover. The black soil between the town of Bonnyville and Ardmore was part parkland and as a result the most fertile soil area, and first settled. Surrounding the 45,000 acres of black soil, or 12 percent of the total area occupied in 1961, is dark grey wooded soil (to the north, east and west). This soil is generally considerably lower in organic matter than the black soil, and could be improved by growing clovers and using artificial fertilizers. South and west of the black soil area and further north of the dark grey soil area is grey wooded soil. This soil was formed by glacial deposition on level to undulating topography. Stones are numerous, causing extensive wear on farm machinery. Originally these areas had a fairly heavy tree cover, mainly of aspen poplar. These soils are very low in natural fertility. This becomes more apparent the longer the soils are cultivated. To produce satisfactory yields, the soil must be built up by fertilizer and rotation practices.

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[1] B.J. Kristjanson and C.C. Spence, loc. cit. p. 1

A preliminary soil survey of the Bonnyville area is being prepared for the ARDA (Agriculture Rehabilitation and Development Act) Land Use Survey.[1] The report will describe the agricultural capability of different soils. A preliminary estimate of the different classifications of soil capability (for agriculture purpose) indicates that approximately 60 percent of the area falls into Class 3; which are soils that have moderately severe limitations restricting the range of crops, or require special conservation practices. About 25 percent was Class 4 and 15 percent Class 5. Class 4 is marginal for sustained arable culture and would require special conservation practice to grow crops. Class 5 may be used for permanent pasture and hay.[2]

Western Red Deer Area

Western Red Deer County has fairly level to gently rolling topography with increased roughness to the southwest. Parkland vegetation predominated the area and as a result the majority of the soils (about 70 percent) are black (chernozemic). The less arable and less productive soils of the grey wooded (podzolic) type are found in pockets with the major concentration in the southwest part of the county. About 10 percent of the area is of the black selonetzic type found near the center of the area. Very small amounts of the lower rated soils are present. The majority of the soils are rated fairly good to very good arable and some rated as excellent arable.[3]

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[1]Alberta Research Council, "Preliminary Soil Survey 63-I, 64-7," Edmonton, 1964, 1965.

[2]"The Canada Land Inventory, ARDA" Report No. 2, 1965, Department of Forestry, Ottawa, Canada, 1966.

[3]T.W. Peters and W.E. Bowser, loc. cit. p. 37 (reference to soil rating map).

The preliminary ARDA classification of soil capabilities for agricultural purposes, indicates that about 57 percent is Class 2, 37 percent Class 3 and the remaining 6 percent is rated below Class 3. Soils in Class 2 have a very moderate limitation restricting the range of crops or requiring moderate conservation practices. Limiting soils for agricultural use are a combination of both climate and soil characteristics. The less fertile soils in the area may be corrected by consistent moderate applications of fertilizers, and grass-grain rotation where required. In general, the Red Deer area is much more suitable for cultivation than all but a small proportion of the Bonnyville area. This can be seen from the ARDA soil classification, where Bonnyville does not have any Class 2 soil, the majority falling into Class 3, with the remaining in Class 4 and 5. The Red Deer soils are more productive under good management and the cost of maintaining fertility is lower.

CHAPTER IV

RESOURCE USE AND FACTORS AFFECTING AGRICULTURAL PRODUCTIVITY

Agricultural growth in the Bonnyville area was compared to that in the western Red Deer area. The comparison showed that farm incomes of the two areas were relatively as far apart today as they were two or three decades ago. This needed to be explained. To do this, economic and non-economic variables affecting agricultural production and productivity per farm operator were examined over a period of time. In each case attempts were made to explain what specific factors affected agricultural output. Resources available per farm operator and the way in which the resources were used explained part of the variation in agricultural output between and within the regions studied. The major variables discussed in this section were farm size, land use, livestock, capital, labor, management, and farm practices as they affected farm and family income.

Rate of Economic Growth

The rate of economic growth in both regions studied was compared before the variables contributing to agricultural output were examined. Two measures were used to indicate the rate of agricultural growth over a period of time. One measure was gross farm income per farm operator and the other was total gross income for the agricultural region as a whole.[1]

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[1]Gross income is the value of all farm products marketed and includes an estimate of the value of farm products consumed on the farm.

Gross income per farm operator increased in the Bonnyville area from $ 664 to $ 3,593 while the average increase in the western Red Deer area was from $ 1,399 to $ 7,185 from 1936 to 1961 (Table 3). The difference in gross income measured in current dollars per farm operator had increased from $ 755 in 1936 to $ 3,592 in 1961. This indicates that Bonnyville farm operators are relatively worse off compared to Red Deer farm operators than they were 25 years ago. Even though the Bonnyville farm operators increased average gross farm income per operator 442 percent or 7.0 percent per year compared to 414 percent or 6.8 percent per year on the western Red Deer farm, the rate of growth was not large enough to decrease the difference in gross farm incomes.[1]

Gross income for the Bonnyville region as a whole increased over 200 percent while the western Red Deer area increased gross income some 400 percent from 1936 to 1961. The difference in regional output shows that the Bonnyville region has failed to achieve the regional output of the Red Deer region. With the exception of the number of workers and number of cattle, the Bonnyville region had a significant increase over the western Red Deer area in livestock numbers and crop area from 1936 to 1961 (Table 4). It appears that western Red Deer farmers must have used more technical inputs while Bonnyville farmers used more traditional means of agricultural production because output was much greater in western Red Deer.

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[1]It is interesting to note that even though the rate of growth is larger for one region than it is for another, this does not mean that the region with a higher rate of growth measured in relative terms (x percent per year) is growing as fast as another region in absolute terms. Both regions would have to have the same absolute gross income (base) as a starting point before percentage rates of growth are meaningful.

TABLE 3

CHANGES IN AVERAGE GROSS INCOME PER FARM AND PER REGION IN BONNYVILLE M.D. AND WESTERN RED DEER COUNTY BETWEEN 1936 AND 1961

Year	Farms	Gross income per farm	Gross income per region
		- Current Dollars -	
		Bonnyville M.D.	
1936	1,723	664	1,146,500
1961	1,035[a]	3,593	3,718,700
Percent change	-40	+442	+224
		Western Red Deer County	
1936	1,292	1,399	1,811,000
1961	1,021	7,185	7,335,800
Percent change	-21	+414	+405

Source: Agriculture Census of Canada.

[a]The estimate of 1,035 farms was derived by adjusting the 941 Bonnyville farms reported in 1961 census of agriculture by a factor of 110 percent because prior to 1956 the area studied was larger - see table 1.

Table 3 may not be a very reliable assessment of economic growth. Agriculture production tends to fluctuate from one year to another and hence the returns to farming in a single year provides an unsatisfactory criterion. An improvement could be made by averaging 1936 with 1942 and 1961 with 1964 (the only other two years reporting output data), however, 1942 was highly productive and 1964 was unusually low for Bonnyville so averaging the pair of years was rejected to minimize further criticism.

TABLE 4

PERCENT CHANGE IN LIVESTOCK AND CROPS FOR BONNYVILLE M.D. AND WESTERN RED DEER COUNTY BETWEEN 1936 AND 1961

	Livestock (numbers)				Crop (acres)		
	Cattle	Sheep	Pigs	Poultry	Grain	Pasture	Fodder
	- Percent Change -						
Bonnyville	+43	+27	+148	+37	+36	+543	+572
Red Deer	+65	-43	+ 60	+17	+12	+155	+164

Source: Agricultural Census of Canada

Number and Size of Farms

A study of the internal organization of the farm business was necessary to determine why output per operator had not increased more rapidly in the low income agricultural region. Output per farm operator is often directly related to the size of farm or business. One measure of size is the total number of acres per farm operator. The number of cultivated acres, crop acres, and intensity of crop or livestock programs are even better measures used to determine the total volume of operation per farm operator. Three methods were used to show the change in size of farms. Firstly, the change in the number of farms and their average acreage was observed over a period of time. Secondly, the change in the distribution of different acreage farm was observed and finally the number of farms were held constant and the increase in size and number were observed.

The average total acreage per farm in the Bonnyville area increased from 228 acres in 1936 to 401 acres in 1961 while farms in western Red Deer increased from 286 acres to 383 acres (Table 5). A better measure of the potential capacity of a farm is the cultivated and crop acreage per farm.

Bonnyville farmers on the average had 40 percent as much improved and crop acreage as farmers in western Red Deer in 1936, but they had 80 percent and 71 percent of the improved and crop acreage respectively of the average western Red Deer farm in 1961. The average output per farm in Bonnyville did not increase as much as the increase in acreage, particularly cultivated acreage. This suggests that Bonnyville farms might not have sufficient crop acreage per operator and that a change in inputs and land use may be required to produce farm incomes more comparable to those achieved by western Red Deer farm operators.

TABLE 5

CHANGE IN NUMBER AND SIZE OF FARMS AND LAND USE IN BONNYVILLE M.D. AND WESTERN RED DEER COUNTY, 1936-1961

Year	Total acres	Improved acres	Crop acres	Farms number	Total acres	Improved acres	Crop acres	Farms number
	- Bonnyville M.D. -				- Western Red Deer County -			
1936	228	64	48	1,723	286	160	119	1,292
1961	401	220	142	1,035	383	276	199	1,021
Percent change	+76	+244	+196	-40	+34	+73	+42	-21
Bonnyville as a percent of Red Deer								
1936	80	40	40	133				
1961	105	80	71	101				

Source: Agricultural Census of Canada

Farm numbers decreased considerably more in Bonnyville than in Red Deer. The number of farms declined 40 percent in Bonnyville from 1936 to 1961 while the number of farms declined 21 percent in the western part of Red Deer County during the same period. This large decrease in farm numbers

enabled Bonnyville farmers to increase the size of the farm and output per operator remaining.

Farm consolidation has taken place more rapidly in Bonnyville than in western Red Deer County. About 7 percent of the Bonnyville farms in 1936 contained three quarter sections or more as compared to 16 percent of the western Red Deer farms (Table 6). The number of farms containing three quarter sections or more had increased to 52 percent in the Bonnyville area and 34 percent in the western Red Deer area by 1961. The average acreage of Red Deer farms was strongly influenced by a few very large farms. In Red Deer 3.3 percent of the farms were over 1,120 acres in 1961.

TABLE 6

PERCENT DISTRIBUTION OF FARMS BY QUARTER SECTIONS, 1936-61

Year	One quarter more or less	Two quarters more or less	Three quarters more or less	One Section or more
		Bonnyville M.D.		
1936	68	25	5	2
1961	24	24	22	30
		Western Red Deer County		
1936	52	32	9	7
1961	35	31	15	19

Source: Agricultural Census of Canada

Recent change in farm acreage from the 1965 survey (of all farms) indicated that western Red Deer farms averaged 467 acres compared to 454 acres per farm in Bonnyville (Table 7). There were 8 percent more operators in Red Deer who were farming in 1965 that had started farming in 1951 or earlier than there were in Bonnyville. Since the western Red Deer farm operators farmed for a longer period of time, this might explain why they were able to increase their land holdings by 43.7 percent from 1951 to 1965 while the Bonnyville operators increased their farm acreage only 36.7 percent.

TABLE 7

NUMBER AND SIZE OF THE 1965 OPERATORS, BONNYVILLE M.D. AND WESTERN RED DEER COUNTY, 1951-61[a]

	Bonnyville M.D.			Western Red Deer County		
	1951	1961	1965	1951	1961	1965
1965 operators	502	666	742	595	717	791
Size of farm	332	394	454	325	413	467
Change in size 1951-65 (%)		36.7			43.7	
Change in number of operators 1951-65 (%)		32.3			24.8	

[a]1965 operators are farmers who were farming in 1965 and may or may not have been farming preceding 1965.

Land Utilization and Farm Activities

Utilization of resources is one of the more significant factors influencing the economic progress achieved in a region. Methods of land utilization and farming activities are two important variables necessary to assess the profitability of the farm enterprize. Utilization of improved land is one of many factors contributing to output per operator. Improved land includes field crops, fallow, and pasture.

One of the more significant changes in Bonnyville has been the rapid increase in improved land as a percentage of total land operated. By 1965 63 percent of the total farm land operated was in cultivation (Table 8). This, however, was attained in Red Deer 24 years earlier in 1941. The increase in number of cultivated acres was a result of the earlier development of farms in Red Deer and the relatively larger acreage of unbroken land in the Bonnyville area. Both regions utilized the improved land in relatively the same proportions in 1936 and 1941, excepting a slightly greater quantity of pasture in Red Deer. Western Red Deer farmers had a slightly larger proportion of improved land in field crops in 1965 while Bonnyville farmers decreased field crops by over 10 percent.

The proportion of improved land in fallow was the factor which varied significantly between the two regions. Red Deer farmers decreased the proportion of improved land in fallow from approximately 25 percent in the 1940's to 10 percent in 1965 and increased pasture acreages, while the percentage of fallow acreage in Bonnyville did not decrease.[1]

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[1]Red Deer farmers use a lot of crop-grassland rotation, and plowing up of grassland which has produced a crop is not considered as summer-fallow by the Agriculture Census of Canada.

The reduction in fallow acreage in Red Deer is a result of the use of more grass and legume field crops in rotation and heavier applications of commercial fertilizers. The persistence of fallow land on Bonnyville farms appeared to be partly due to less fertile land and the failure to adopt better crop rotation and fertilization practices.

TABLE 8

DISTRIBUTION OF IMPROVED AND UNIMPROVED LAND, BONNYVILLE M.D. AND WESTERN RED DEER COUNTY, 1936 AND 1965

Year	Improved				Unimproved		
	Total	Field crops	Fallow	Pasture	Total	Woodland	Native pasture and waste
	(percent)						
	Bonnyville M.D.						
1936	28	75	19	2	72	60	40
1965	63	61	19	16	37	67	33
	Western Red Deer County						
1936	57	75	20	5	44	42	58
1965	77	78	10	9	23	47	53

Source: Agriculture Census of Canada

The acreage of hay and fodder per farm was two-thirds greater in Red Deer than in Bonnyville, whereas, fallow acreage was one-third greater in Bonnyville than in Red Deer in 1965 (Table 9). There has been a significant increase in pasture in both regions, but Red Deer farms have managed to stay well in the lead with an average of 26 acres per farm in 1961 compared with 16 acres in Bonnyville.

TABLE 9

AVERAGE DISTRIBUTION OF FARM LAND PER FARM, BONNYVILLE M.D. AND WESTERN RED DEER COUNTY, 1936 AND 1961

Census year	Field crop	Hay and fodder	Improved pasture	Summer-fallow	Total improved	Total un-improved	Total farm
			(acres)				
			Bonnyville M.D.				
1936	45	3	1	12	64	164	228
1961	112	30	16	55	220	181	401
			Western Red Deer County				
1936	103	16	8	31	160	126	286
1961	146	53	26	41	276	107	383

Source: Agriculture Census of Canada

Some significant changes have occurred in the production of field crops in both areas. A shift from cash grain to feed grain and livestock has occurred in both regions, but wheat has maintained its position in Bonnyville, whereas it has been largely replaced by barley in Red Deer (Table 10). Approximately 50 percent of the cropland in both regions was sown to wheat during the 1930's. However, many factors have caused the acreages, devoted to particular crops, to change. One cause for change in field crop acreage was the Federal Government's wheat acreage reduction policy, effective from 1941 to 1943, which had the effect of decreasing wheat production in both regions in 1941 and increasing coarse grain production. Given the grain quota system, Red Deer farmers found it advantageous to shift to a greater production of livestock. The growth of a malting variety of barley was also common practice in Red Deer to avoid the restrictions of the quota system. Bonnyville farmers were not

affected to a large degree by either the wheat acreage reduction policy or the grain quota system, because of the lower crop yields.

TABLE 10

DISTRIBUTION OF FIELD CROPS, BONNYVILLE M.D. AND WESTERN RED DEER COUNTY, 1936 AND 1961

Year	Wheat	Oats	Barley	Mixed grain	Hay and fodder
		(percent)			
		Bonnyville M.D.			
1936	58	24	12	-	5
1961	33	20	15	10	20
		Western Red Deer County			
1936	46	20	20	-	13
1961	4	14	50	4	27

Source: Agriculture Census of Canada

Bonnyville farmers had 33 percent of their field crops in wheat, 45 percent in coarse grains and 20 percent in hay in 1961. Red Deer farmers had only 4 percent in wheat, 68 percent in coarse grains and 27 percent in hay. Red Deer was able to produce many more cattle and hogs, due to the increased acreage devoted to coarse grain and hay, than Bonnyville with its concentration on wheat in a non-wheat-land region. Specialization in livestock maintains soil fertility through grass and legume rotations. In the more fertile Red Deer area grassland rotation is not as necessary as in the less fertile Bonnyville area, where very little grassland rotation is practised.

Livestock Production

The changes in the numbers of the various kinds of livestock are indicative of changes in farm organization and farm practices. Both regions were developing a livestock based economy from 1941 to 1965. Red Deer farmers have been increasing cattle production, while Bonnyville farmers are concentrating more on hog production.

The cattle industry increased more rapidly in Red Deer between 1951 and 1961 when total cattle numbers doubled (Table 11). There was no substantial increase in the number of cattle in the Bonnyville M.D. area during any census period except for a 40 percent increase from 1951 to 1961. The total number of milk cows in the Bonnyville area decreased by 40 percent from 1946 to 1961, while the number in Red Deer decreased about 50 percent from 1936 to 1961.

The number of hogs in both regions was approximately the same in 1961, although the number of head increased more rapidly in Bonnyville, 162 percent compared to a 42 percent increase for Red Deer from 1931 to 1961. The number of hogs recorded in any census year from 1931 to 1961 was highest for both regions in 1941, the demands of a war-time economy having produced a favorable grain-hog ratio. Sheep and poultry have not made significant changes in number and their contribution to the farm economy is of little importance in both regions.

The number of cattle and pigs per farm and per acre illustrates the productive capacity on a per farm and per acre basis. The number of cattle per farm in Bonnyville as a percentage of the number of cattle per farm in Red Deer indicates that Bonnyville farms have maintained about 50 to 60 percent of the number of cattle supported per farm in Red Deer, excepting

1956 when Bonnyville managed to reach 74 percent (Table 12). Bonnyville hog producers have been able to increase the number of hogs per farm as a percentage of the number of hogs per farm in Red Deer from 48 percent in 1936 to a high of 147 percent in 1956. More recently, Bonnyville farms had 68 percent of the number of hogs supported by Red Deer farms in 1965.

TABLE 11

CHANGE IN NUMBER OF LIVESTOCK AND POULTRY IN BONNYVILLE M.D. AND WESTERN RED DEER COUNTY, 1931-1961

Year	Cattle			Sheep	Hogs	Poultry (000)
	Total	Milk	Other			
			Bonnyville M.D.			
1931	8,621	3,359	5,262	1,577	10,834	76.3
1936	14,937	6,189	8,748	2,492	11,481	78.8
1941	14,063	7,740	6,323	2,797	28,842	119.3
1946	16,831	8,387	8,447	4,069	16,921	19.4
1951	15,344	7,476	7,868	2,128	20,806	103.8
1956	17,998	5,432	12,567	2,347	23,746	130.2
1961	21,424	5,120	16,304	3,170	28,421	107.7
			Western Red Deer County			
1931	15,233	6,322	8,911	8,654	20,519	116.5
1936	25,443	10,492	14,951	7,946	18,098	103.4
1941	20,071	7,649	12,422	5,154	40,956	123.3
1946	22,865	6,322	16,543	7,332	20,741	131.7
1951	21,149	5,940	15,209	3,280	21,629	114.1
1956[a]	-	-	-	-	-	-
1961	42,088	5,818	36,270	4,500	28,997	121.4

Source: Agriculture Census of Canada

[a]Not available.

TABLE 12

RATIO OF CATTLE AND HOGS PER FARM AND PER ACRE IN BONNYVILLE M.D. AS A PERCENTAGE OF WESTERN RED DEER COUNTY, 1936-1965

Year	Cattle/farm	Pigs/farm	Cattle/acre	Pigs/cultivated acre
		(Percent)		
1936	44	48	55	120
1946	59	65	64	114
1956	74	147	49	199
1965	59	68	65	84

Source: Agriculture Census of Canada 1936-56, 1965 Farm Survey

Bonnyville farmers have not made any increase in the number of cattle supported per acre of land in comparison with Red Deer farmers from 1936 to 1965. Bonnyville farmers had about 65 percent as many cattle per acre as did Red Deer farmers in 1965, or 0.0893 cattle per acre, while Red Deer farmers had 0.1376 cattle per acre. Bonnyville farmers had a greater proportion of hogs per cultivated acre than Red Deer farmers except for 1965, and twice as many hogs per acre as Red Deer farmers in 1956.

With the present allocation of field crops, Bonnyville farmers could not raise many more hogs in 1965 in addition to cattle, without buying feed or devoting a greater acreage to coarse grains. Bonnyville farmers did not have any surplus grain to feed hogs in 1965. Red Deer, on the other hand, could have more than quadrupled hog production in 1965 because of excess coarse grain production. Considering the amount of coarse grain available, excluding other factors in hog production, Red Deer farmers could have produced nearly ten times more hogs per farm on the average

as could Bonnyville farmers in 1965, without additional grain purchases. According to K. Davies, Co-op feed salesman, some of the hog producers in Bonnyville purchased hog feed from Edmonton. Red Deer farmers also purchased hog feed, much of which was livestock concentrates as revealed by H.C. Love in a study, the results of which are as yet not published (see page 110).

The average number of cattle supported per farm in Red Deer was higher than in Bonnyville in 1965, although there was a greater percentage (94) of farmers reporting cattle in Bonnyville than in Red Deer (89). Red Deer and Bonnyville farms on the average reported 63.6 and 37.5 cattle per farm respectively in 1965 and 88 and 38 head per farm respectively for farms reporting cattle.

Seventy-four percent of the Bonnyville farmers had hogs in 1965 while only 59 percent had hogs in Red Deer. The average number of hogs per farm was 45 in Red Deer and 28 in Bonnyville, but the average per farm producing hogs was 79 hogs in Red Deer and only 39 hogs in Bonnyville. Of the farms reporting hog production in Bonnyville 56 percent reported 25 or fewer hogs per farm, whereas in Red Deer only 26 percent of the hog producers had 25 or fewer hogs per farm. This and other evidence suggests that the Bonnyville area has many mixed farms while Red Deer farmers tend to specialize in either cattle, hogs, or grain farming with a smaller number of mixed farmers.

There were three times more feeder steers in Red Deer than in Bonnyville in 1965. More Red Deer farmers specialized in purebred lines of cattle, three farmers out of the 136 sample farms surveyed raised purebred bulls in large numbers for export and domestic use. The total number of cattle per farm in both regions was directly related to the number of acres per farm. Nearly twice as much cultivated pasture as well as a little

more native pasture and cropland was needed per head of cattle in Bonnyville than in Red Deer. In addition to native pasture and cropland Bonnyville farmers used woodland for cattle production.

In order to increase output of livestock per farm in Bonnyville it will be necessary to reorganize land usage. By increasing acreages and productivity of cultivated pasture and hayland it will be possible to raise more cattle. More crop land acreage will have to be converted from wheat to coarse grains if hog production is to be increased.

Capital Investment and Operating Capital

Investment

For the purpose of this section capital will mean the value of all inventories, including the value of land. Up to a certain point capital is a good common denominator because it reduces the value of land, livestock and machinery all to common terms. The measure is more meaningful when all the farms compared produce essentially the same products. It may have little meaning for comparison if the farms have different specialties, since some inputs require the use of more labor than others.

The amount of capital invested is used as a measure of the size of the business and determines the amount of income that is to be realized as a return to capital and labor. The amount of capital invested in the various farm inputs should be proportional to the productivity of the inputs. The capital requirement of a successful farm business is increasing with increasing use of technology, because capital replaces more and more agricultural labor.

The trend toward increasing capital requirements is evident in both Red Deer and Bonnyville where the average investment per farm in current dollars increased about 10 fold from 1936 to 1965 (Table 13). The total investment per farm in Bonnyville in 1965 was $27,267 or less than one half of the average farm investment of $75,692 in Red Deer.[1] High appreciation of land values is one reason for the rapid increase in Red Deer farm values. Average land values in Bonnyville were about $40 per acre in 1965, approximately one third of the Red Deer average, whereas in earlier years the value was about the same in both areas. In 1965, land and buildings accounted for 73 percent of the total investment in the Red Deer area as compared with 58 percent in the Bonnyville area, however, in earlier years the percentages were about the same in both areas.

Red Deer farms maintained approximately twice as much investment in machinery and equipment as Bonnyville except for 1961. Machinery and equipment accounted for 18 percent of the total investment in the Red Deer area as compared with 25 percent in the Bonnyville area in 1965. Livestock investment as a percentage of total investment was generally higher in Bonnyville than in Red Deer.

The percentage of land, machinery and livestock investment was similar for both regions in earlier years. Recently Bonnyville farms have shown a high percentage investment in machinery and equipment and a lower investment in land and buildings than farms in Red Deer or Alberta as a whole. The land-machinery investment ratio was 4:1 in Red Deer and 2.3:1 in Bonnyville. It would appear that Bonnyville has too much capital

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[1]The estimate of investment per farm in western Red Deer County is probably high due to errors in sampling. The exclusion of all partnerships from the Bonnyville sample and only a few from the western Red Deer area decreased the average total investment per farm in Bonnyville relative to western Red Deer farms.

invested in machinery or too little capital invested in land. A comparison of the marginal value productivity of the resources would be required to see if capital investments were properly allocated in both regions.

TABLE 13

AVERAGE INVESTMENT PER FARM, BY MAJOR CATEGORIES, BONNYVILLE M.D. AND WESTERN RED DEER COUNTY, 1936-65

Year	Land & bldg.	Percent of total	Machinery & equipment	Percent of total	Livestock & poultry	Percent of total	Total
			Bonnyville M.D.				
1936	$ 2,070	71	$ 443	15	$ 414	14	$ 2,928
1941	1,612	64	689	18	668	18	3,731
1946	3,974	64	1,239	20	957	16	6,170
1951	5,790	51	3,099	27	2,517	22	11,406
1961	10,523	54	4,949	25	4,067	21	19,539
1965	15,924	58	6,887	25	4,455	16	27,267
			Western Red Deer County				
1936	$ 5,366	75	$ 823	12	$ 927	13	$ 7,117
1941	5,389	68	1,346	17	1,240	15	7,956
1946	7,995	66	2,163	18	1,878	16	12,037
1951	13,017	58	5,193	23	4,414	19	22,625
1961	22,743	62	7,417	20	6,452	18	36,609
1965	55,269	73	13,504	18	6,919	09	75,692

Source: Agriculture Census of Canada, for 1936-61.
Survey data for 1965.

Distribution of investment in land, machinery, and livestock varied with farm size in the Bonnyville area. Red Deer farmers, regardless of farm acreage, maintained approximately the same percentage of investment in land (over 71 percent of total investment) while Bonnyville farmers did not. Investment in machinery and livestock as a percent of total investment was different in both regions. Bonnyville farms decreased the percentage of capital investment in machinery equipment from 28 percent to 24 percent

as the farm size increased, whereas Red Deer farms increased investment in machinery and equipment from 16 to 20 percent. The percentage investment in livestock doubled with size of farm in Bonnyville increasing from 13 to 26 percent, whereas with the increasing size of farms in Red Deer there was a decrease from 13 to 10 percent throughout for livestock.

The higher proportion of capital invested in machinery and equipment by Bonnyville farmers may represent an over-investment. The investment in machinery however suggests that Bonnyville farmers have moved from the period of pioneering and traditional farming and have more fully mechanized their farms. The problem is that these farmers have failed to increase their investment in land to compensate for the low soil fertility and to optimize the use of their present farm machinery. As investment in land continues many farms will achieve more optimum economies of scale.

Some Bonnyville farmers have not readjusted land use to the increased cost of farm machinery. Wherever land yields low returns the enterprise should involve large land areas relative to the amounts of capital and labor used with it.[1] In other words poorer land is put to extensive uses, whereas fertile land may be farmed intensively utilizing greater amounts of capital and labor.[2] Many Bonnyville farmers who should be farming extensively are farming just as intensively as Red Deer farmers. Some of the smaller farms in Bonnyville had a greater investment in machinery and equipment than in land and buildings in 1965. The smaller acreage group in Bonnyville (less than 240 acres) had similar machinery

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[1] Raleigh Barlowe, "Land Resource Economics," p. 143.

[2] Not only infertility produces marginal lands but also increased cost of production, and transportation costs. Any changes in production and marketing costs affect land-use intensity.

and equipment investments per cultivated acre as in Red Deer[1] (Table 14). However, the investment declined with increased farm size in Bonnyville farms while it remained constant in Red Deer. For the larger acreage group (760 acres and over) machinery and equipment investment per cultivated acre was less than one-half as large in Bonnyville farms as in Red Deer. These figures suggest that the larger acreage Bonnyville farms were able to adjust agricultural production towards a cattle based rather than a grain farming economy thus reducing their machinery investment per acre and utilizing their land more efficiently. For example, the largest acreage group averaged 13 percent more cattle per improved acre than did the smallest acreage group in Bonnyville. The smallest acreage group had only 13 percent of total investment in livestock, whereas the largest acreage group had exactly twice the percentage (26 percent) of total investment in livestock.

In Red Deer the largest acreage group (760 acres and over) had $39.80 invested in machinery and equipment per acre while the smallest acreage group (240 acres and less) had $38.35. Actually, if the machinery was the same age on both the large and small acreage group and if the present inventory value used was representative of the amount of machinery on these farms, then either the larger acreage Red Deer farm group have

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[1]The same investment per acre does not mean that small farmers in Bonnyville have the right amount of machinery investment. It means the opposite if we are to use Red Deer as our model farm. The small Bonnyville farmer should not have the same amount of investment per acre because he should not farm with such intensive labor and capital. In other words Red Deer farmers have invested about $38.00 in machinery per $120.00 worth of land. The small Bonnyville farmer has invested $38.00 of machinery on $40.00 worth of land. Therefore, comparisons on a dollar for dollar basis do not agree with comparisons on a dollar per acre basis, indicating that small Bonnyville farmers have too much invested in machinery in comparison to land.

over invested or the smaller acreage group have under invested in farm machinery and equipment because they should not be both the same.[1] One reason for this estimated over-investment on large acreage farms may be that more up-to-date machinery is being used. The machinery investment on small acreage farms in Bonnyville may also be too high if the machinery has a very low inventory value when assessed by present day replacement cost.[2]

TABLE 14

DISTRIBUTION OF FARMS, AVERAGE CULTIVATED ACRES, AND MACHINERY AND EQUIPMENT INVESTMENT PER CULTIVATED ACRE, BONNYVILLE MUNICIPAL DISTRICT AND WESTERN RED DEER COUNTY, 1965

Size of farm	Number of farms		Average cultivated acreage		Machinery & equipment per cultivated acre	
	Bonny-ville	Red Deer	Bonny-ville	Red Deer	Bonny-ville	Red Deer
Acres					$	$
Less than 240	21	26	115	126	37.75	38.35
240-399	50	43	212	243	26.92	35.88
400-559	39	27	292	341	27.80	39.16
560-759	18	18	392	519	22.29	36.56
760 and over	8	22	574	724	18.80	39.80

[1]See table XII in appendix where new machinery investment per acre on small farms is over twice as large as big farms.

[2]B.H. Sonntag, "Farm Machinery Syndicates in the Prairie Provinces" in Canadian Farm Economics Vol. 1, No. 3, Aug. 1966 p. 14. Using a cross study of farms in the Prairie Provinces for 1960-64, Sonntag shows that the farmers present value of replacement costs of farm machinery were 32 percent, 39 percent and 46 percent on small, medium and large farms respectively.

The distribution of farms by amount of investment was markedly different in the two areas, with more than one half of the Bonnyville farms below $25,000 and none above $80,000 (Table 15). In contrast, only 10 percent of the Red Deer farms had total investments below $25,000 and 36 percent were above $80,000, and a few exceeded $160,000. There were 11 percent of the Bonnyville farms who had a total investment under $10,000, which is far below the minimum required for the types of farming prevailing in the area. A $25,000 investment per farm in either area is still far too low to combine with a man year of labor and produce a satisfactory income.

TABLE 15

DISTRIBUTION OF FARMS BY TOTAL FARM INVESTMENT, BONNYVILLE M.D. AND WESTERN RED DEER COUNTY, 1965

Total farm investment (dollars)	Bonnyville M.D. Number	Bonnyville M.D. Percent	Western Red Deer County Number	Western Red Deer County Percent
Less than 10,000	15	11	0	0
10,000 - 24,999	54	40	14	10
25,000 - 40,000	42	31	17	13
40,000 - 79,999	25	18	56	41
80,000 - 159,999	0	0	40	29
160,000 and over	0	0	9	7
Total	136	100	136	100
Minimum	$3,460		Minimum	$14,360
Maximum	$76,870		Maximum	$241,340
Mean	$26,267		Mean	$75,692

Credit

The acquisition of capital in sufficient amounts may be a crucial problem in agricultural productivity, and the major factor retarding economic growth. There must be enough capital for operating expenses, the adoption of new technology, and adjustment of resources including labor mobility, if the individual farmer is to maximize his income. Brownstone states that farm credit helps to achieve general economic objectives such as increased total output and labor productivity as well as improved income distribution.[1] Farm credit should be extended to enhance the development flexibility, mobility of resources required for economic growth, and to achieve personal income goals.

Acquiring capital from savings carried within the industry is usually a slow process, especially in low-income regions. In areas where the level of production is low such a large proportion of farm income is required for consumption purposes that it makes accumulation of capital difficult.

Farmers who cannot save enough capital can borrow from lending agencies. However, because equity is usually the basic criterion used to determine the amount of capital the farmer can borrow, and because of the large amount of capital needed at times, the farmer may not always obtain the credit he needs. This type of capital rationing may be referred to as external capital rationing in agriculture. There are other farmers who do not borrow or restrict the amount they borrow because they do not try to maximize profits, they fear credit, they are too proud, they lack knowledge, they are reaching old age or some other reason. This type of rationing may be referred to as internal rationing.

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[1]Meyer Brownstone, "Farm Credit - 1959," Canadian Journal of Agricultural Economics, Vol. VII, 1959, pp. 47-52.

It is likely that there is internal and external capital rationing affecting the rate of growth in the Bonnyville region and this should be corrected wherever possible. If internal rationing exists, more education directed to the use of credit may help the region. If external rationing is also a problem then the nature of the restriction that impedes the flow of funds into agriculture must be studied and some adequate credit market must be developed.

In the Bonnyville area approximately one half of the farmers said that they did not have sufficient capital in contrast to one-quarter of the Red Deer farmers who felt that they lacked capital. The majority of these farmers felt they needed additional capital for either machinery, livestock or for farm operation. Eleven percent of the farmers lacking capital in Red Deer and 18 percent in Bonnyville said that they also lacked land.

In the Bonnyville area 82 percent of the farmers had outstanding loans in 1965 while 75 percent had outstanding loans in the Red Deer area. Of the 18 percent who did not have any outstanding loans in the Bonnyville area, the average age of the farmer was 47 years, and he had a lower than average total investment. Two-thirds of these farmers said that they lacked capital.

Outstanding indebtness constituted a higher proportion of farm assets in Bonnyville than in Red Deer. The percent equity on Bonnyville farms with debt varied from 62 percent for the youngest group (20 - 29 years old) to 89 percent equity for the older group (50 - 59 years of age). The equity distribution was slightly lower in Red Deer because of the large use of rented real estate.

In Bonnyville the 20 to 49 year age group had a greater number of farms with loans than in Red Deer, while the 50 and over age group had fewer farms with loans in Bonnyville than in Red Deer. The greatest number of farms with loans were made by farmers between the age of 30 to 49 in Bonnyville and between 40 and 59 in Red Deer (Table 16).

TABLE 16

MEAN DEBT, EQUITY AND INVESTMENT FOR ALL FARMS IN BONNYVILLE M.D. AND WESTERN RED DEER SAMPLE SURVEY, 1965

Age group	No. of farms	Percent who made loans	Estimated mean net worth[a]	Mean investment	Estimated mean value rented real estate	Mean debt	Percent equity
			Bonnyville M.D.				
20 - 29	17	77	$14,763	$23,052	$2,051	$6,237	64
30 - 39	41	93	18,505	25,488	1,754	5,228	73
40 - 49	38	92	24,927	32,861	2,223	5,711	76
50 - 59	26	77	24,442	26,834	500	1,891	91
60 +	14	36	20,466	23,106	1,255	1,384	89
Total	136	Average	21,168				
			Western Red Deer County				
20 - 29	7	72	$86,239[b]	$107,321	$21,083	$7,200	80
30 - 39	27	82	61,745	79,459	7,242	10,471	78
40 - 49	34	88	65,149	83,958	7,953	10,855	78
50 - 59	30	87	63,400	76,940	9,115	4,425	82
60 +	38	58	58,630	68,903	3,326	1,947	92
Total	136	Average	63,351				

[a]Mean net worth was estimated by subtracting estimated value of rented land and buildings.

[b]The large figure of $86,239 for the estimated mean net worth results from the inclusion of the figures for a partnership and one high investment of nearly $250,000 for one young farmer. With these two figures removed the estimated figure would be $45,000.

The largest loans were borrowed by the youngest farmers (20 - 29 age group) in Bonnyville even though they had the lowest mean net worth, while the 30 - 39 age group made the largest loans in Red Deer. Because of the low net worth in Bonnyville, it is likely that external rationing may be in effect. Red Deer farms have larger loans but could have borrowed much more on the average.

The oldest farmers in Bonnyville and in Red Deer did not have the largest average net worth contrary to previous assumption.[1] In both cases it was the 40 to 49 year old age group that had the highest average investment. The oldest group of farmers in both areas had approximately as much average net worth invested as did the youngest group of farmers.

The borrowing patterns were almost identical in the two areas, land purchase accounting for 55 percent of the debt, machinery for 23 percent and farm operations for 9 percent in each area. The number of loans as a percent of the total number of loans was also similar in both regions. However, there was a substantial difference in the size of the Red Deer loan as compared to the Bonnyville loan. In each case the Red Deer loan was nearly twice as large, and for some types even more than twice as large. There was also a difference in the source of loans, and Bonnyville farmers borrowed relatively more frequently from the Farm Credit Corporation, finance companies, and merchants than did the Red Deer farmers. Banks led in numbers of loans in both areas but made three-fifths more loans in Red Deer than in the Bonnyville area. Both regions had the same relative

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[1] The assumption based on a thesis by Neil Campbell "A case study in Economic Development, page 50, was that the oldest farmers had the largest capital investment.

length of loans, however, Bonnyville's debt outstanding was higher (86%) than Red Deer's (77%) due to the greater difficulty in retiring the loan.

Debt varied among farm tenure groups. In Red Deer the average debt for owner operators was over $2,000 less in all age groups, than it was for part owners. In Bonnyville the opposite occurred. The owners on the average borrowed larger sums than did the part owners. This should be expected if the part owners are renting part of their resources rather than buying them. The farmers who rented real estate in Bonnyville operated a total average investment which was smaller than that operated by full owners.

To determine the amount of capital rationing and the degree of internal and external rationing in both regions two reference points were used. Firstly, farmers who had sufficient incomes and did not desire additional capital to increase their incomes were considered to be unaffected by any form of capital rationing. Secondly, farmers who did not have sufficient incomes and desired additional capital were considered to be affected by external rationing. Farmers in this income group who felt they had sufficient capital were considered to be practicing internal capital rationing.

Bonnyville farmers considered $3,100 or more to be a satisfactory net income. An income less than this was considered unsatisfactory because incomes could be increased by the use of additional capital. A net income of $4,000 was considered satisfactory by Red Deer farmers following the same procedure (Table 17).

TABLE 17

CLASSIFICATION OF FARMERS BY CAPITAL CHARACTERISTICS AND TENURE, BONNYVILLE M.D. AND WESTERN RED DEER COUNTY, 1965

Net farm income	Tenure: Owner	Non-owner	Part owner	Partnership	Average age	Average investment	Proportion of sample (percent)
	(number of farmers)						
Bonnyville M.D.							
Greater than $3,100 (sufficient capital and income)	8	0	2	0	45	$42,411	7
Less than $3,100[a] (sufficient capital)	54	1	2	0	44	26,908	42
Less than $3,100[b] (insufficient capital)	56	1	12	0	42	25,347	51
Total	118	2	16	0			
Western Red Deer County							
Greater than $4,000 (sufficient capital and income)	35	0	20	5	48	$111,948	44
Less than $4,000[a] (sufficient capital)	26	0	14	1	51	51,152	30
Less than $4,000[b] (insufficient capital)	25	1	7	2	52	47,818	26
Total	86	1	41	8			

[a]Operators said they had sufficient capital.

[b]Operators said they did not have sufficient capital.

In Red Deer 44 percent of the farmers appeared to have sufficient income and capital. These farmers had an average investment of $111,948 and averaged 44 years of age. Thirty percent of the Red Deer farmers earned less than $4,000 net income and said they had sufficient capital. Their average investment was less than half that of the former group which had sufficient income and capital. These farmers practiced internal rationing. They may have felt that they did not need additional capital because 35 percent of them were renting real estate. The remaining 26 percent of the farmers indicated that they did not have enough capital. These farmers were subjected to external rationing, however, given the opportunity to borrow, it is difficult to say whether they would all do so. This group had the lowest capital investment and 25 percent of them were renting real estate.

The degree of internal and external rationing in Bonnyville appeared to be higher than in Red Deer. A net income of $3,100 was considered satisfactory to warrant sufficient capital (a figure less than this was not considered sufficient by some farmers who indicated that more capital was required). In Bonnyville only 7 percent of the farmers appeared to have sufficient capital to produce a satisfactory income by their standards. This group which averaged 45 years in age, had an average investment of $42,411 (this investment was even smaller than the Red Deer group which felt they did not have sufficient capital).

About 51 percent of the Bonnyville farmers appeared to fall into the external rationing group and of these farmers 10 percent were renting real estate to make up for part of their capital deficiency. This group was the youngest group and had the lowest average investment of $25,347 (this also includes the value of rented real estate).

Fourty-two percent of the Bonnyville farmers who felt they had sufficient capital had less than $3,100 net income. Many and possibly all of the farmers in this group were practicing internal rationing. Some had borrowed all they could get and therefore felt they had sufficient capital or it was all they would borrow under present conditions.

Summarizing, it seems that an unusually large number of Bonnyville farmers are using borrowed capital. They indicate that additional capital would be desirable. Since credit is extended as a proportion of net worth, many small farmers have actually borrowed all the funds they could get. Although more farmers in Bonnyville appear to practice internal rationing it may be because of the higher interest rates some farmers must pay and also because of their inability to save, they feel it is best not to borrow any more. The fact that certain inputs come in large quantities (land, combines) may be another reason for not considering additional capital. With the newly available syndicate type of loan many small farmers will be able to purchase some of the inputs which were impossible to purchase individually before.

Family Labor

The output of a region depends upon both the quality and quantity of available labor. The quality or physical capacity of labor is affected by: age, sex, mental or physical defects, training, health and motivation. The number of human services available in a region can affect output, as the laborer may be underemployed, partly employed off the farm, or fully employed in relation to other resources on the farm. Whenever a region must support a large number of people, growth may be retarded as fewer savings can be invested into the agricultural economy. The extent to which

family labor may influence growth in the studied regions was determined by observing its characteristics and behavior.

To avoid overestimating the labor force on small farms and underrating the relative productivity of the labor, a common adjusted unit of measure in man-years was made.[1] It is not uncommon to find large farms operated under a father-son arrangement. If a farmer does not have a son, the older farm operators tend to rent or sell part of their holdings and farm on a smaller scale. The same thing occurs if a man is unmarried and does not have any young helpers on the farm.

The Red Deer farms had an available labor force of 1.52 man-years per farm which was significantly larger than the 1.29 man-years per farm in the Bonnyville area. Bonnyville supported a larger number of persons (4.31) as did the Red Deer farms (3.51) on the average. The larger labor force in Red Deer was mainly due to the large number of father-son or partnership type arrangements. This accounted for approximately 30 percent of the man-years of available labor on the Red Deer farms.

The large number of older farm operators in Red Deer decreased the number of available man-years of labor. However, the smaller quantity of available labor as a result of age in Red Deer was offset by off-farm employment in Bonnyville. In the Bonnyville area, 34 percent of the farm operators worked a total of 25 man-years off the farm compared with

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[1]See table XIV in the appendix for the method used in calculating the man-years of labor. Other methods of calculating using different weights or scores have been used but did not appear to be as satisfactory to the writer. See "Economics of Resource Use in Farm and Nonfarm Opportunities," Georgia Bull. 43, p. 55 and A.M. Tang, "Economic Development in the Southern Piedmont, 1860-1950," C. Chapel Hill: University of North Carolina Press, (1958), pp. 246-7.

20 percent working 17 man-years off the farm in the Red Deer sample.

The distribution of available family labor by size of farm was similar in both regions. As the average size of farm increased, so did the amount of available family labor. The smallest size farm employed one man-year of labor in both regions. But as the farm acreage increased, Red Deer farmers employed more labor per acre than did Bonnyville. However, the quantity of labor used per acre is a poor criterion to use in determining whether some of these men are underemployed. One common measure of the amount of available labor required on the farm is the ratio of production to the labor input or "labor efficiency."[1] This essentially is a measure of the output per man employed on a farm. The output is measured in productive man work units (p.m.w.u.). One man is able to produce about 300 or more units per year depending upon the amount of capital investment per worker.

Family labor was most efficiently employed on the larger acreage group (760 acres or more) farm in both study areas. These large farms in Bonnyville produced more output per man-year than did any other size of farm in Bonnyville or Red Deer. The high volume of output per man-year was not accomplished through high capital investment per worker. These farms employed one-half the investment in machinery and equipment in dollars per acre as compared to the other farms. The high output was the result of better than average management and more hours of hard work.

The other smaller acreage groups of farms in Bonnyville produced considerably less productive man work units than did the Red Deer farms

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[1]T.A. Petersen and B.J. McBain, "Alberta Mixed Farm Production Cost Studies, 1951-1955," Alberta Department of Agriculture, Dairy Branch, Edmonton, Alberta, p. 25.

of similar acreage. The labor on small Bonnyville farms was underemployed and inefficiently employed, considering the excess amount of available family labor per farm and the low farm output.

Twenty-six percent of the Bonnyville farmers and 9 percent of the Red Deer farmers attributed part of their unsatisfactory income to lack of labor. There may be a shortage of labor on the farms operated by older operators. However, this is surely not the case on other farms in Bonnyville. It is more apt to be lack of managerial ability to farm more extensively or the shortage of capital that causes farmers to think that they lack labor.

Out migration of farm labor has been more prevalent in the Bonnyville area and has contributed to the reorganization of farm factors of production. There was a 37 percent reduction in net farm population from 1940 to 1961. Most of the people who have migrated from Bonnyville farms have been less than 25 years or more than 60 years of age. Despite the large off-farm migration the Bonnyville region has a high level of disguised unemployment and a slow rate of economic growth. A higher rate of off-farm migration seems to be necessary for adjustments which would provide benefits in terms of larger units and higher incomes to the remaining farmers.

It would not be difficult to find people willing to leave the area. Forty-four percent of the farm operators in 1965 indicated willingness to give up farming and to accept nonfarm employment. These farm operators had been unable to leave farming for a number of interrelated factors. The most important handicaps were the absence of alternative job opportunities, lack of alternative skills and job training, and low

levels of education. Among the social-psychological factors it was found that 56 percent of the operators had a strong attachment to farming.[1]

Management

Management, as well as land, labor, and capital, can be classified as a factor of production. To observe or measure managerial ability is indeed difficult because, in contrast to the other three variables, it eludes qualitative and quantitative measurement. Two methods were employed to measure managerial ability in both regions studied. First a comparison was made of the various indicators generally associated with managerial ability. These indicators were more of a qualitative measure which varied from psychological attributes to ability in learning and assimilating information. Farm practices as related to production and income was the second measure used because these practices were commonly good indicators of managerial ability.

The fundamental role of management is in expectations, planning, action, and acceptance of the consequences. In many cases the management variable will be the limiting factor of agriculture production. Uncertainty and other management limitations can therefore limit the size of farm. Adding more land, labor, and capital creates the need for better management. As Taylor pointed out, uncertainty may introduce decreasing productivity and increasing costs, causing limitations in the size of farm.[2] Psychological

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[1]For greater insight into the problems of mobility of farm people in the Bonnyville area, see George E. Buckmire, "Occupational Mobility of Farm People in the Bonnyville District - A Low Income Agricultural Area," Department of Agricultural Economics, University of Alberta, Edmonton, Agricultural Economics Special Report No. 1, May 1966.

[2]H.C. Taylor, "Outlines of Agriculture Economics," New York: Macmillan, 1925, pp. 177-83.

and physical characteristics of individuals may limit farm size as well; an example is internal capital rationing, a psychological characteristic which limits farm size expansion.

Good managers are often found on fertile soils and poor managers on less productive soils. It is not the soil which produces a poor manager. Poor managers, however, tend to migrate to poor soils because of their lower abilities to "prove" themselves elsewhere. It is the contention of agricultural specialists that in many cases great rewards to management are to be had in areas which have previously been considered "low income" regions.

Attributes of Managerial Ability

Management involves formulation of a plan to combine available resources in such a way as to maximize farm production. Some farmers have confidence, know how to improve their efficiency, and do it, while others lack the necessary facts upon which to base their decisions. One indication of potential managerial ability is in the effort to farm more efficiently. Managerial ability is displayed in obtaining reliable information on farming through discussion with others at farm meetings or involvement in community affairs. Western Red Deer farmers, on the average, took part in 2.77 farm and social organizations as compared to 1.75 participations by Bonnyville farmers (Table 18). Seventy percent of the farmers in the western Red Deer area belonged to three or more organizations compared to only 53 percent in the Bonnyville area. This may be partly explained by the difference in level of education in both regions. Approximately 90 percent of the Red Deer farmers had grade seven or more, while only 68 percent of the Bonnyville farmers had this level of education.

TABLE 18

INDICATORS OF MANAGEMENT, BONNYVILLE M.D. AND WESTERN RED DEER COUNTY, 1965

	Score[a]		Bonnyville M.D.	Western Red Deer County
		Units	Percent	Percent
Organizations attended	2	4 or more	25	49
	1	3	28	21
	0	2 or less	47	30
Education (grade)	2	9 or more	28	44
	1	7 and 8	40	45
	0	6 or less	32	11
Magazines, Newspapers and 10 or more books	2	6 or more	36	73
	1	5	18	13
	0	4 or less	46	14
Used fertilizer	2	$200 or more	26	64
	1	$1 to 199	18	10
	0	0	56	26
Percent gross return on capital investment	3	17.2 or more	32	34
	2	14.0 - 17.1	13	21
	0	13.9 or less	55	45

[a] In order to determine the association of management with gross income, the indicators were weighted and given a score. Bonnyville farmers had an average score of 4.5 units as compared with 6.3 units per farm manager in Western Red Deer.

Farmers with better education are usually better managers. The farmer with more information has a greater chance of making the best decision. Farm papers, market reports, agricultural radio and television programs and agricultural representatives provide information for the farmer. Western Red Deer farmers, on the average received 6.3 weekly newspapers and magazines while Bonnyville farmers received 2.6 weekly newspapers and magazines. Nearly all the farmers in Bonnyville and Red Deer had radios but Red Deer farmers received more stations. Only 56 percent of the Bonnyville farmers had television sets as compared to 86 percent of the Red Deer farmers. Bonnyville farmers, however, had poor reception from one station while most Red Deer farmers had fairly good reception from two stations. Farm records are essential to efficient farm management. More reliable than memory or guesses, good records allow the farmer to analyze the past and present data and to make better decisions. The agricultural extension services carried on a program on farm records in the Red Deer area. Many Red Deer farmers were using these services and kept good farm records. Similar services were not extended to Bonnyville farmers. Most farmers in the Red Deer area responded to certain questions in the field survey by consulting record books while most of the Bonnyville farmers "pulled figures out of the air."

Farm Practices as Indicators of Managerial Ability

The acceptance and use of recommended farm practices was frequently related to managerial ability.[1] Soil fertility tests and application of necessary commercial fertilizers are examples of recommended practices. The

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[1]R.S. Rust, "Farm Survey Data Relationships with Managerial Ability," The Economic Annalist, Vol. XXXIV, No. 1 Feb. 1964, p. 11.

1965 survey showed that 75 percent of the western Red Deer farmers had applied commercial fertilizer on their grain and forage crops, while only 40 percent of the Bonnyville farmers had followed the same practice. Red Deer farmers applied $3.03 worth of fertilizer per cultivated acre. Bonnyville farmers applied $1.17 worth of fertilizer. The use of fertilizer characterized better management but even more indicative was the application of the right kind and quantity of fertilizer. Five Bonnyville farmers used the feed and soil testing facilities available whereas 57 Red Deer farmers had taken advantage of this service in 1961. More Bonnyville farmers used the feed and soil testing service in 1965.

Use of chemicals and grain-grassland rotations to increase field crop yields are also indicative of better management. In the Bonnyville area, where crop rotations are recommended, only 16 percent of the farmers reported a grain-grassland rotation compared with 26 percent of Red Deer farmers who employed this practice on black soils. To increase crop yields, 28 percent of the field crops were treated with chemicals controlling obnoxious weeds in the Red Deer area, while only 15 percent of the crops in the Bonnyville area were treated in 1959. Both regions in 1965 more than doubled the acreage treated.

Managerial ability contributes significantly to successful livestock production, particularly in aspects such as selection of animals and efficiency of operation. The production of healthier animals resulted in a 79 percent calf crop survival on Red Deer farms compared to 69 percent on Bonnyville farms. To compare the quality of cattle, bulls over one year old were studied in each region. Bulls from the western Red Deer area averaged $287 each while the Bonnyville bulls averaged $225. Bonnyville farmers reported 2.3 bulls per 100 head of livestock. Red Deer farmers

reported 1.3 bulls per hundred head of livestock. Although Red Deer farms have more feeder steers, the difference in the number of bulls per 100 head of cattle suggests a greater use of artificial insemination in the Red Deer region. Red Deer farmers were producing over twice as many cattle or hogs per farm, indicating more efficient use of labour in livestock production, compared to the Bonnyville farmers.

Farm production and income are often indicative of managerial ability. While good management affects both production and income, a high income does not always follow from a high degree of managerial ability. A high capital investment may be attributable to higher managerial ability or to inheritance of large sums of capital. The higher return on investment obtained by Red Deer farmers compared to Bonnyville farmers does, however, seem to indicate better managerial ability.

The net return from gross sales indicates further differentiation in management between the two regions. The gross ratio or ratio of total expenses to gross income is a combined measure of the profit making ability of the farm. It is computed by dividing total expense by gross income. This ratio expresses the percentage of gross income consumed by expenses and is, therefore, independent of the absolute size of the business. Gross income and total expenses both affect the ratio. On smaller farms more labor is substituted for expenses than on larger farms. Gross sales can be high where more inputs are purchased rather than partly produced on the farm. The gross ratio was 0.608 in Red Deer and 0.679 in Bonnyville on the average for all farms. This indicates that for every dollar of gross sales Bonnyville farmers had relatively higher expenses. This ratio, as expected decreased with the size of farm and was 0.577 and 0.644 for Red Deer and Bonnyville small farms respectively, except for the fourth size class of

Red Deer farms (560 to 759 acres) which had a lower ratio than the average size farm preceding and following it.

Judicious use of resources to maximize production includes efficient use of land. In view of recommended practices on grey wooded soils, Bonnyville farmers should be adapting to a livestock based economy.

In a comparison of successful and less successful farm operators in Alberta on grey wooded soils McFarlane concluded:

> This study of the most successful farms located on grey wooded soils emphasizes the key role of management. Soil management techniques, at various levels of fertility, require differing levels of managerial ability and it is this ability, as indicated by crop rotation, that yield characterizes the superior manager.[1]

Bonnyville cropland practices in 1956 were compared to those of McFarlane's successful farmers and to his less successful farmers in the same year. An additional comparison of Bonnyville cropland practices in 1964 was made to those of the Rocky Mountain House farmers in that year (table 19). The use of cropland on Bonnyville farms in 1956 was similar to that of McFarlane's less successful farms in all respects. Bonnyville farms and the less successful farms both devoted more land to the production of wheat and to summer fallow, and less to hay and pasture. The successful farms had 40 percent of their cropland acreage in pasture and hay as compared to only 14 percent of cropland in pasture and hay on Bonnyville farms. The increase in hay and pasture crops was one factor which, McFarlane found, increased subsequent crop yields.

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[1] R.J. McFarlane, "Some Factors Contributing to the Success of Farm Operators on the Grey Wooded Soils of Alberta," Economic Annalist, XXIX, No. 6 (Dec. 1959), p. 43.

TABLE 19

DISTRIBUTION OF CROPLAND ACRES IN SPECIFIED AREAS COMPARED WITH BONNYVILLE IN 1956 AND 1964

Crop	Bonnyville[a] farms, 1956	McFarlane's[b] unsuccessful farms, 1956	McFarlane's[b] successful farms, 1956	Bonnyville farms, 1964	Rocky Mountain House[c] farms, 1964
	percent of total cropland				
Wheat	19	11	8	17	3
Oats	13	19	20	11	13
Barley	23	24	17	12	14
Other crop	4	2	1	5	2
Hay & Fodder	8	12	27	14	10
Pasture	6	7	13	17	43
Fallow	24	21	13	19	15
Other	3	4	1	5	0

[a]Agriculture Census of Canada.

[b]R.J. McFarlane, loc. cit., p. 141.

[c]W.J. Lockhart "Farm Organization Study Grey Wooded Soils, Rocky Mountain House Region Alberta 1964," Canada Department of Agriculture Economic Branch.

Comparison of cropland use on Bonnyville farms and Rocky Mountain House farms in 1964 revealed that even though Bonnyville farmers had doubled the proportion of crops in hay and pasture from 14 percent in 1956 to 31 percent in 1964, the Rocky Mountain House farmers had more (53 percent) of their cropland in hay and pasture. While Bonnyville farmers had approximately 17 percent of their cropland in wheat, Rocky Mountain House farmers devoted only 3 percent of their cropland to the production of wheat.

In conclusion, it appears that the managerial ability, as shown by certain attributes and farm practices, of the Bonnyville farmers was rather low in comparison to Red Deer farmers. This suggests that management was one of the important factors which affected the rate of agricultural production in the Bonnyville area.

Farm Income and Family Earnings

One of the best available measures of a farmer's success in attaining his economic goal was his net farm income. Other measures such as gross farm income or total farm family income are better measures of the size of farm operation and are closely related to net farm income in most cases, though not in all.

The net farm income levels in Bonnyville and Red Deer were considerably different. The Bonnyville income was less favorable than that of Red Deer in two ways. The rate of return to labor and capital was lower in Bonnyville than it was in Red Deer and lower farm incomes are not favorable to economic growth because part of the farm income must be allocated to either (a) current consumption or (b) reinvestment in the business as a basis for later income and consumption. When a substandard net farm income results, current consumption absorbs all or nearly all of the net income leaving very little to re-invest in the farm business. Red Deer farmers were in a more favorable position because they could re-invest part of their returns, increasing their capital investment. In contrast, the Bonnyville farmers practice a more subsistence type of agricultural production. In their own value terms, 85 percent of the Bonnyville farmers and 40 percent of the Red Deer farmers stated that their incomes were unsatisfactory. The Bonnyville farmers who were willing to leave agriculture wanted the same level of income as did the Red Deer farmers also willing to leave agriculture. Although both regions had considerably different levels of income, their similar economic goals are suggested by desires to attain equal off-farm incomes.

Average gross sales per farm were nearly three times greater in Red Deer as compared with Bonnyville in 1964 (Table 20). Considering $5,000 gross income per farm as a minimum figure, 72 percent of the Bonnyville farms and 22 percent of the Red Deer farms had unsatisfactory gross incomes. Twenty-six percent of the Red Deer farms sold over $15,000 worth of agricultural products compared with 3 percent in Bonnyville. This suggests much larger farms in Red Deer than in Bonnyville.

TABLE 20

PERCENTAGE DISTRIBUTION OF FARMS BY GROSS FARM INCOME, BONNYVILLE MUNICIPAL DISTRICT AND WESTERN RED DEER COUNTY, 1964

Gross farm income	Bonnyville M.D.	Western Red Deer County
dollars	percent	percent
Less than 1,200	13	0
1,200 - 2,499	20	5
2,500 - 3,749	24	7
3,750 - 4,999	15	10
5,000 - 9,999	23	35
10,000 -14,999	2	17
15,000 -24,999	2	10
25,000 - and over	1	16
Total	100	100
Minimum	$ 0	$1,210
Mean	$ 4,106	$11,697
Maximum	$28,454	$43,330

Net farm income and net family income provided a better indication of the money available to the farm family for household consumption and reinvestment in the farm business than did gross income. Seventeen percent of the farmers in Bonnyville reported negative net farm incomes as compared to two percent in Red Deer (Table 21). Sixty-five percent of the farmers reporting negative farm incomes in Bonnyville were engaged in some type of off-farm employment and reported an average off-farm income of $2,350. Evidently these operators either found it necessary to undertake off-farm work because of the low farm returns or they neglected their farming operations in favor of off-farm employment.

The majority of the Bonnyville farms earned low net incomes, 67 percent earned less than $2,000 as compared with only 25 percent of the Red Deer farms. Red Deer farms earned on the average three and one-half times the net earnings of Bonnyville farms. Considering the larger number of laborers per Red Deer farm, a more realistic figure for net farm income was derived by dividing the average net farm income by the average number of man-years employed per farm. The average net farm income per man-year was $1,035 in Bonnyville and $3,025 in Red Deer. The differential net incomes per man-year for Red Deer farms was now less than three times that of Bonnyville farms.

Total net family income included both farm and non-farm family earnings. Using this measurement, the variation between net farm family earnings in the two areas is less than the variation between net farm incomes. The average net family income in Red Deer was approximately two and one-half times that of Bonnyville. The Bonnyville farmers earned 41 percent of their family income from non-farm sources as compared with 19 percent for Red Deer farmers. (In absolute terms Red Deer farmers earned

an average of $150 more off-farm income per farm than did Bonnyville farmers.)

TABLE 21

PERCENTAGE DISTRIBUTION OF FARMS BY NET FARM INCOME AND NET FAMILY FARM INCOME, BONNYVILLE M.D. AND WESTERN RED DEER COUNTY, 1964

Income class	Bonnyville M.D.		Western Red Deer County	
	Net	Family	Net	Family
dollars	percent	percent	percent	percent
Less than 1	17	5	2	0
1 - 999	29	21	8	4
1,000 - 1,999	21	22	14	8
2,000 - 2,999	21	22	13	12
3,000 - 3,999	8	17	18	16
4,000 - 4,999	3	9	15	16
5,000 - 5,999	-	2	6	10
6,000 - 7,999	-	1	7	12
8,000 - 9,999	-	-	7	8
10,000 - 13,999	-	1	7	10
14,000 and over	-	-	3	4
Total	100	100	100	100
Minimum	$ -1,417	$ -530	$ -840	$ 568
Mean	$ 1,325	$ 2,221	$ 4,599	$ 5,653
Maximum	$ 10,350	$10,666	$17,330	$18,038

Livestock and livestock products were the most important sources of gross farm income in both areas (Table 22). Livestock income was more important in Bonnyville, although the sales from livestock and livestock products per farm were much lower than in Red Deer. The relative difference in livestock incomes per farm in both regions was even greater when the difference in livestock income per farm reporting livestock sales was compared.

Red Deer farms obtained twice as much income from livestock as did Bonnyville farms, however the average difference was three times as great per farm reporting livestock sales. This indicated greater specialization in Red Deer and greater diversification of enterprizes on Bonnyville farms. While hogs were more important than cattle as an income source in Bonnyville, and the reverse was true in Red Deer, there were many farms in Bonnyville raising cattle but not reporting any sales. (This might be the result of small farms expanding milk cow herds.)

Crop sales were substantially different in the two regions. Bonnyville's crop income was primarily from wheat sales, whereas barley provided the dominant crop income in Red Deer. While 74 percent of the Bonnyville farms reported wheat sales averaging $725 per farm, 29 percent of the Red Deer farms reported wheat sales of $2,261 per farm. The same difference occurred in barley sales except that Red Deer farms reported sales of approximately eight times the value of Bonnyville sales. While cash sales were more important, both absolutely and relatively in the Red Deer area, Red Deer also produced more coarse grains for feeding livestock.

Other sources of income were not significantly different. While income in kind was higher on Red Deer farms, it made up a much smaller percentage of total income as compared with that of Bonnyville. Operating

expenses were proportionately greater in Bonnyville as a percentage of gross income, resulting in a lower net income. While this was the case in 1964, the ratio of expenses to income may have been higher than normal as 1964 was not a normal year. That is, gross sales were below normal in 1964 due to three successive crop failures in the region contributing to a higher than average expense-gross sales ratio.

TABLE 22

AVERAGE RECEIPTS AND EXPENDITURE PER FARM, BONNYVILLE M.D. AND WESTERN RED DEER COUNTY, 1965

Item	Bonnyville M.D.		Western Red Deer County	
Cash income	dollars	Percent of gross	dollars	Percent of gross
Livestock & products				
Cattle	893	22	2,860	25
Hogs	1,056	26	2,364	20
Poultry & eggs	40	1	76	1
Dairy products	542	13	1,179	10
Other	14	-	22	-
Total livestock	2,545	62	6,501	56
Crops				
Wheat	537	13	665	5
Barley	44	1	2,669	23
Oats	20	1	197	2
Other	74	2	346	3
Total crops	675	17	3,877	33
Supplementary payments	345	8	709	6
Total cash income	3,565	87	11,087	95
Income in kind	541	13	610	5
Total gross income	4,106	100	11,697	100
Operating expense	2,781	68	7,098	61
Net income	1,325	32	4,599	39
Nonfarm income	896	22	1,054	10
Net family income	2,221	53	5,653	51

If a 5 percent return is allowed on investment and the remainder of the net farm income is allocated to family labor (man-year) the average farm return per man-year in Bonnyville was $171 as compared with $819 in Red Deer. On the other hand if the investment earned the residual net farm income, allowing $2,000 per man-year of labor, the average return to investment on Bonnyville farms was negative compared with 2.5 percent in Red Deer.[1]

In summary, Red Deer farmers appear to be better off in all dimensions of farm operation. Cash incomes were higher for all types of farm products because greater quantities were produced. While Bonnyville farms were smaller in all aspects of production and gross sales per farm, the higher proportion of non-farm income helped to alleviate the low farm income problem for some farmers. While the large difference in incomes was attributed to inadequacy of farm capital per unit of labor, the intensity with which land was employed, and managerial ability, differences in weather and the optimum size of farm were undoubtedly important.

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[1] Investment excludes rented land and debt.

CHAPTER V

POSSIBILITIES FOR AGRICULTURAL GROWTH IN THE BONNYVILLE AREA

In view of the number of resource use adjustments made, incomes remained relatively low in Bonnyville. Some economic growth had occurred as a result of the adjustments. Farmers responded significantly to differences in income opportunities. The response has taken the form of a substantial migration of farm people from farm to non-farm work. There has been some increase in part-time farming and a substantial change in the efficiency of production. Increase in farm size, shift to livestock production, increase in machinery and equipment investment and adoption of technology are but a few changes.

In spite of the adjustments which have been made in order to increase the efficiency of production of farm commodities and for the transferring of labor out of agriculture, agricultural incomes in Bonnyville remain relatively low. Many of the people owned too few resources to earn incomes sufficient to maintain a minimum level of living in their community. The return these people obtained from their resources did not provide sufficient income to sustain a socially desirable level of living and promote growth. Many farmers are underemployed, have little education, misuse resources, thereby failing to maximize output, and are not efficient agricultural producers.

The problem of perpetuated low-incomes in Bonnyville may result from slow adjustment. It is probable that more people will find it profitable to transfer to non-farm employment and that extensive changes are necessary to increase the farmer's income.

Change Required in Agricultural Production

The lagging growth of Bonnyville agriculture is evident in its low productivity. It was suggested that increased agricultural production could be derived by employing resources more efficiently. Present resource combinations were observed in both study areas to see if more output could be achieved by recombining present resources and or by employing more resources to yield increasing returns to scale.

A Cobb-Douglas type production function was used to estimate the efficiency of resource use and indicate changes for increased productivity. In general form the Cobb-Douglas function can be stated as $Y = aX_1^{b}X_2^{b'} \ldots X_m^{n} U$ which is linear in logarithms. A production function was desired to indicate both needed changes in input mix and returns to scale, as well as showing whether off-farm migration was necessary to permit the adjustments required for agricultural growth. Some of the defects of the Cobb-Douglas function are: elasticity of production remains constant, marginal productivities decline for all values of the inputs, and marginal rates of resource substitution are always negative. Although the function does not place any limits on total output as do some production functions, it is not safe to predict total output much beyond the average and never outside the range of observation included in the original data.

The measure of agricultural productivity chosen for this study was gross income per farm.[1] The correlation between gross income and various

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[1]Gross income included total sales of farm production during the current year plus perquisites with no consideration given to changes in inventory.

other factors was derived by employing a stepwise regression program.[1] Considerable time and effort was spent on some independent variables (total acres, cultivated acres, machinery and equipment) which did not show significant correlation with gross income.[2] Several statistical tests (coefficient of multiple determination, the t-test, and the coefficient of simple and partial correlation) served to support the non-linear model selected. Tests were made with different combinations of factors to arrive at the following equation:

$$Y = 0.784 \quad X_1^{0.384} \quad X_2^{0.304} \quad X_3^{0.333} \quad X_4^{0.317} \quad X_5^{0.216} \quad X_6^{0.078} \quad X_7^{0.001}$$

(t values 2.51 4.69 2.84 2.89 1.52 0.54 0.01)

Where Y = gross farm income
X_1 = current expenses
X_2 = investment in livestock
X_3 = investment in land and buildings
X_4 = management
X_5 = family labor
X_6 = cultivated acres
X_7 = investment in machinery and equipment

All the above terms except for management, labor, and acres were in dollar terms. Management was based on an index composed of five different factors.[3] Family labor was converted into man-years by adjusting corrective factors to age, sex, and off-farm work.[4]

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[1] A stepwise regression selects the independent variables in order of decreasing correlation with the dependent variable.

[2] Multicollinearity existed with a few variables and therefore their separate contribution to gross income could not be measured. By dividing the value of land and building by acres yields a new variable - "value of land per acre," which was associated with income but this only indicates that more expensive land is associated with income. It does not, however, show any association between the number of acres and income.

[3] See table 18 for five factors used.

[4] See appendix table XVIII on method used in calculating man-years of family labor.

The t-test indicated that current expenses, livestock investment, land and building investment, and management were all significant at the one percent level, while labor was significant at the 15 percent level. However, cultivated acres (total acres was tried) and investment in machinery and equipment did not add significantly to the explanation of variance in the dependent variable. The t-test also indicated both variables were not acceptable, so there was as much chance in obtaining the coefficient by chance in random sampling as not. Being insignificant, the last two variables were dropped. Labor, although it was not too significant, was left in the regression to prevent under or over estimating the contributions to gross income of other variables. After dropping the last two variables the resulting equation was:

$Y = 0.076$	$X_1^{0.419}$	$X_2^{0.305}$	$X_3^{0.352}$	$X_4^{0.315}$	$X_5^{0.219}$
(t values	3.11	4.74	3.19	2.90	1.55)

The five remaining independent variables explained 65 percent of the variance in gross farm income. The elasticity of the production function was 1.61 indicating substantial positive returns to scale. In contrast, the elasticity of the production function derived for Red Deer was 1.02 which indicated constant returns to scale.[1] Some farms had diminishing returns while some farmers had increasing returns. This was evident in the returns to investment on different size farms found earlier.

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[1]The corresponding final regression equation for the Red Deer region was

$Y = 1.112$	$X_1^{0.611}$	$X_3^{0.215}$	$X_4^{0.176}$	$X_5^{0.087}$	$X_7^{0.076}$
(t values -	14.25	4.52	2.79	1.95	1.81)

These five dependent variables explained 91 percent of the variance in gross farm income.

Marginal value products were calculated for all five variable inputs at the level of their geometric mean for both Bonnyville and Red Deer.[1] Each variable's contribution to gross output was observed in order of decreasing correlation with the dependent variable.

Current Expenses

Current expenses explained most of the variance in gross income. Current expenses included fixed expenses as well as variable expenses as they were not reported separately. Therefore, part of the return to machinery and buildings in the form of depreciation charges (fixed expenses) were accounted for by current expenses. However, it was felt that this would not have a serious effect on the estimation of the production function.

The marginal input of one dollar of current expenses in Bonnyville returned only 56 cents to gross farm income. In contrast current expenses returned $1.10 for the marginal dollar spent in Red Deer, a sum which is more than sufficient to cover short term interest loans for expenses such as fertilizer, fuel, chemicals, and seed. This suggests that the Bonnyville farmers are either over spending or under spending on their variable inputs. That is, they are making expenditures which are not profitable but could be profitable if greater expenditures were made. Farm expenses usually do not fluctuate from year to year like farm income. However, with three successive crop failures preceding this survey, expenditures tended to be higher than normal. Some expenditure on items such as fertilizer may have been unprofitable during the dry year of 1964. Interpretations of the

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[1]Since the Cobb-Douglas function is linear in logarithms, the average of logarithms is actually the average of a product or the geometric mean. Some studies have been made by interpreting the coefficients rather than their marginal products, and this could lead to false conclusions.

production function based on only one year's highly unreliable data should indicate the shortcoming in placing too much confidence in limited findings. The absence of farm records could have led to possible bias of the derived production function.

Livestock Investment

Livestock investment produced high marginal returns to investments on Bonnyville farms. A 29 percent gross return to livestock investment was recorded at the geometric mean (a 22 percent gross return at the arithmetic mean) or approximately a 4 to 5 percent net return above the average interest costs of 6 percent. (Similarly as in the case of current expenses, livestock sales occupied a greater proportion of gross sales because of poor crop yields and the findings, therefore, may be higher than normal). However, this high return was supported by further evidence of the potential profitability of expanded livestock production. Livestock production was found to be more intensive on the Red Deer farms and no doubt this is the reason why livestock investment did not appear to have a significant influence on farm income at the margin. Having greater specialization in hogs, grain or cattle would also tend to diminish the effects of livestock investment on gross income for Red Deer farms. Analysis of the crop land use pattern in Bonnyville indicated that considerable land, presently in wheat and fallow, could be put to better use (with fertilizer) producing forage for livestock and coarse grains for hogs.

Land and Building Investment

Land and building investment contributed 8 percent return to gross income, at the margin. This is above the average cost of $5\frac{1}{2}$ percent to

obtain real estate capital.[1] However, if the farm was expanded from a $16,000 to a $25,000 investment in land and buildings, the marginal returns to investment (holding other variables constant) dropped to only 5 percent, which is below the average cost of borrowed capital. It appears that Bonnyville farmers should not expand their land investment beyond $25,000 unless money was borrowed at a lower interest rate allowing such an adjustment to be profitable. However, if the land earns an additional 6 percent per year through land appreciation, it would be profitable for Bonnyville farms to expand farm holdings until the marginal returns are less than 5 percent. Red Deer farmers have realized this and have expanded their land and building investments until they received about 4 percent returns on the margin. Further expansion of farm size in the Red Deer area would not be profitable for the larger farms.

Management

Management also contributed to output in both regions. Management itself is very difficult to transform into quantitative terms. However, in order to measure the effect of different managerial abilities, a composite index was made. The index contained the following factors: education, reading material in the home, participation in farm organization, use of fertilizer and percent gross return on capital investment. Bonnyville farmers averaged 5.5 units and Red Deer farmers averaged 8.0 units out of a maximum score for management of 12 units. The higher management score achieved by Red Deer farmers reveals greater managerial ability as compared with Bonnyville farmers.

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[1]Alberta Farm Purchase Board charges 5 percent interest which includes life insurance. Farm Credit Corporation rates start at 5 percent and increases to over 6 percent on loans over $20,000 or $27,000. Farm Improvement Loan rates are 5 percent.

The marginal value products for land, livestock, labor, and machinery were calculated holding management at three different levels (Table 23). The marginal value products that were calculated, independent of management, for the four variables showed considerable variations which were either under or over those estimated when compared to the marginal value products that were estimated when management was included in the regression, as an independent variable. Management also had a strong influence on the marginal value products of most of the variables when management scores were varied from the 25th to 75th percentile rank. For example at the 25th percentile management level the marginal value product for land and building investment was nearly 7 percent return on investment, however, the better Bonnyville managers could expect a return of 9 percent.

A similar analysis was made for the Red Deer region for the purpose of comparing returns to variables for different managerial abilities. The results indicated that Bonnyville farmers had a wider range of managerial ability and consequently it is doubtful that managers with lower levels of ability could make effective use of increased farm size. Since management places restrictions on the use of many variable inputs, and often the level of management limits the size of farm that can be operated efficiently, many Bonnyville farmers need additional education and training before they could operate larger farms efficiently. The differences in managerial ability in Red Deer was less pronounced because of less variance in managerial ability and a higher level of ability.

Family Labor

The last variable, family labor, was not very significant in either of the study areas. Marginal returns to the labor input were approximately $430 in each area. The removal of one farm worker's contribution to gross

TABLE 23

MARGINAL VALUE PRODUCTS, BONNYVILLE M.D. AND WESTERN RED DEER COUNTY, 1964

Physical input	Variable	Unit of measure	Independent of management	Marginal Value Product Estimates		
				25th	50th	75th percentile
			Bonnyville M.D.[a]			
Operating expenses	X_1	$100	$ 82.49	$48.84	$57.39	$63.80
Livestock invest	X_2	100	24.77	24.68	29.00	32.24
Land & Bldg. invest	X_3	100	6.08	6.85	8.05	8.95
Labor supply	X_5	1 man year	272.00	369.00	433.00	482.00
			Western Red Deer County[b]			
Operating expenses	X_1	100	119.00	104.60	110.04	114.44
Land & buildings	X_3	100	3.45	4.14	4.36	4.53
Machinery & equipment	X_7	100	8.21	6.59	6.93	7.20
Labor supply	X_5	1 man year	405.00	404.80	425.00	443.00

[a]Derived from the equations:

$Y = 0.0765 \quad X_1^{0.491} \; X_2^{0.305} \; X_3^{0.352} \; X_4^{0.315} \; X_5^{0.219}$

(t = 3.11 4.74 3.19 2.90 1.55)

$Y = 0.242 \quad X_1^{0.609} \; X_2^{0.198} \; X_3^{0.269} \; X_4^{0.136}$

(t = 5.11 6.36 2.57 1.08)

[b]Derived from the equations:

$Y = 1.112 \quad X_1^{.611} \; X_3^{.215} \; X_4^{.176} \; X_5^{.087} \; X_7^{.076}$

(t = 14.26 4.52 2.79 1.95 1.81)

$Y = 1.309 \quad X_1^{.671} \; X_3^{.173} \; X_7^{.092} \; X_4^{.085}$

(t = 17.63 3.73 2.14 1.85)

farm income would not significantly reduce the value of farm production, and consequently the farm income. The level of farm income per worker could evidently be improved by emigration from farms in both regions.

Cultivated Acres and Machinery and Equipment

The two variables, cultivated acres and investment in machinery and equipment, did not appear as significant variables in the regression equation for Bonnyville. However the simple correlation between these two variables and gross income was about .54. These variables also had a fairly similar simple correlation with current expenses, land and building investment, livestock investment, and with each other. Partial correlation with the dependent variable was low for both variables. It was impossible to conclude anything definite because cultivated acres indirectly could have contributed to gross income and that additional machinery and equipment was not profitable as general observations indicated earlier.[1] In Red Deer the marginal return to investment in machinery and equipment was about 7 percent.

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[1]The test of a given independent variable, is whether it is correlated with other independent variables. Thus in the case just discussed, although acres and machinery investment showed little correlation with income they did show significant correlation with the other independent variables. But if the correlation between the variables in question and the other variables is high we have what is called multicollinearity which occurs when two defined variables are highly correlated with each other. When this occurs it is not possible to measure their separate influences upon the explained variable. When this exists between two or more variables, it is not possible to hold one constant and measure the effect of a change in the other variable, that is, the true partial correlation. See Ezekiel and Fox, "Methods of Correlations and Regression Analysis," New York, John Wiley and Sons, Third ed. p. 195.

Model Farm Characteristics for Bonnyville

A model farm was determined to give the reader some indication of the adjustment required in Bonnyville and the possible returns to the operator if the adjustment was made. The derivation of a model Bonnyville farm was not based on any sophisticated statistical calculations but by using the regression analysis, trends and practices in both regions, and cross checks with existing farm positions. The model farm will closely represent the fourth acreage group (560 to 759 acres) of Bonnyville farm discussed previously. Drawing conclusions simply from regression coefficients was hazardous and subject to error. However, if they are supported by findings reported earlier, as well as a general working knowledge of the two study areas, recommendations could be made for the adjustments necessary to promote growth.

Evidence from other grey-wooded areas and from within this study indicated that the farmers should invest in more livestock and increase the size of their holdings in order to benefit from increasing returns to scale. The regression analysis indicated fairly high returns to livestock investment. A shift to more livestock production would improve land use by increasing forage production and consequently grain yields. Livestock production would reduce risk and uncertainty which farmers have recently encountered in the Bonnyville area. Wheat acreage could be shifted to coarse grain production and grass land substituted for summer fallow to allow more cattle and hog production.

Increased farm acreage is supported by: returns to land and buildings, underemployment, the need for more extensive land use, provision to increase cattle numbers and more efficient use of machinery and

equipment. The high returns to scale of 1.6 also suggests increasing the size of farm especially for those resources which have high marginal returns.

Changes in Average Resource Mix

Three basic changes in resource use were made to arrive at the model farm. Livestock investment was increased by two standard deviations ($6,950) because of the high marginal returns to livestock investment. Even though land acreage was also increased, the increased investment in livestock could not be supported on one section of land without changes in land use. Wheat acreage and fallow would have to be reduced and coarse grain and forage production would have to be increased. Increased yields of coarse grain and forage could also be increased through a good crop rotation and the application of commercial fertilizer.

Land and building investment was increased by one standard deviation ($9,380) or 220 acres. However, as soon as land consolidation takes place, land prices may go up and the marginal value productivity of land would decrease, therefore, some allowance for a lower marginal productivity had to be made.

Current expenses would increase with the increase in farm size. But if better farming practices were adopted and higher crop yields were expected over the poor year of 1964, it would be safe to assume that the expense-gross income ratio of 0.68 would decrease and approach that of the Red Deer area of 0.61. The new current expenses for the model farm would then increase from the present average of $2,800 to about $4,500 on the model farm. A minor change in machinery and equipment investment was made with the increase in size of farm in order to obtain more efficient use

of the present over investment in machinery. An average investment of $18.00 per cultivated acre was assumed sufficient because the larger acreage farm in Bonnyville was getting by with an average investment of $18.80 per cultivated acre whereas, large farms surveyed by the prairie economic branches had an average investment of only $16.50 per acre between 1960 and 1964.

Substituting the new quantities of input variables into the estimated production function and solving for the dependent variable (gross income) produced a gross income for the average model farm. Allowing a 5 percent return to investment, a labor return of $1,165 would be realized as compared to a negative labor return of -$43.00 on the present average size farm. However, if the farmers with less managerial abilities move off the farms and if the model farmer was one of the top 25 percent in managerial abilities, he could gain an extra $365 net income without any additional cost. His return to labor would be about $1,530. Previously in this study, under the heading of Capital an average investment of $42,411 produced net farm incomes over $3,100. This substantiates the fact that the model farm investment of $43,700 is not unrealisticly high to yield an average income of $3,350.

In general the model farm characteristic would be:

Average 1964		Model farm
420	Total acres	640
265	Cultivated acres	400
$15,924	Investment land and buildings	$25,300
$ 4,454	Investment livestock	$11,400
$ 6,889	Investment machinery and equipment	$ 7,000
$27,368	Total investment	$43,700
$ 4,106	Gross farm income	$ 7,850
$ 2,781	Current expenses	$ 4,500
$ 1,325	Net income	$ 3,350
$ 1,368	Investment returns (5%)	$ 2,185
$ -43	Labor return after allowing return to investment	$ 1,165
$ 10	Top 25 percent in managerial ability labor return	$ 1,530

The number of farmers which would have to migrate from the Bonnyville area was not determined. Nevertheless a large percentage of the farmers would not need to leave. Since about 40 percent of the Bonnyville farmers already had one section of land or more, leaving 60 percent of the farmers, some of whom should consolidate their farm holding, thus only a certain percentage of the 60 percent group would leave agriculture. Many farmers supplement their farm income with off-farm income or farm intensively (hog farm, dairy farmer etc.) and they need not increase the size of farm in acres operated if they are not underemployed. Those farmers (40 percent) who already have one section of land would still have to increase their livestock investment and adjust land use to support more livestock. Farmers with poor land would require more land than the "model farm" while others with fertile land could farm more intensively and would require less.

At present, the average total investment of $27,368 includes rented land and borrowed capital to the extent of about $6,000. With the new model farm an additional $16,000 of capital and rented real estate would be required. This means that the average net worth of the model would be less than 50 percent. It is evident,therefore, that considerable large sums of capital are required for this adjustment to take place. It appears that the development of the model farm hinges on the problem of obtaining sufficient capital and the manager ability to successfully adopt the recommended farm practices.

Policies for Promoting Growth and Adjustment

The rapid rate of technological development within agriculture permits increased productivity and causes lower prices for farm commodities. With a smaller and smaller profit margin more efficiency and increases in

production require the substitution of capital for labor and land in certain cases. This creates the problemsof both obtaining more capital and labor migration. As the operation grows larger attaining economies of scale, greater managerial skills are required to operate the larger holding. For agricultural policies to be effective they must deal at one time with all phases of the dynamic problems that face the adjusting agricultural industry.

Resource Requirements and Redistribution

Consolidation of small farms is necessary in order to achieve economies of scale. This would reduce the degree of underemployment and provide a necessarily more extensive type of farming. Such a program would require enlarging farms only for those with sufficient managerial ability, regardless of the amount of equity. This can be achieved through more liberal land loans or by government purchase and either reselling or leasing land to the smaller farmers. Reducing farm numbers to enable farm consolidation also requires assistance in the re-establishment or reallocation of outmigrant farmers, whether it be to cities or larger farms. This is a field for ARDA participation.

Capital in the form of livestock and current operating expenses, in addition to land and buildings are necessary, as suggested by regression analysis. The shift to a livestock based economy could be made more quickly if temporary subsidies were given for: grass seed, the purchase of pure bred breeding stock, freight concessions for feed concentrates, community pasture and other necessities to promote livestock industry.

Farmers making an adjustment conversion of land use from grain production to a grain-livestock combination will require assistance. The

conversion of marginal land into community pastures may be necessary if it is the best use to which such land can be put.

Adjustment Achieved by Education and Extension Services

Extension people could provide additional help to farm people in making adjustments called for by the technological revolution. For example the livestock based economy suggested, could become uneconomical in a number of years. Extension work is required continuously to inform the farmer of the necessary adjustment. How much capital and what type is necessary to produce a satisfactory income, supplementary income sources, methods of enlarging the farm unit if necessary and alternatives to farming are but a few questions that need be answered. In other words, improving management is basic to the improvement of farm income. Extension services should provide training and information for the improvement of managerial abilities. Advantages of growing legumes (in 1963 while conducting soil experiments a farmer in Bonnyville growing alfalfa had never heard of nitrogen nodules) soil conservation, use of commercial fertilizers and chemicals, role of a balanced diet in livestock feeding are but a few items of knowledge necessary to farm operators.

Vocational training is needed, especially in trades and industry and in the service field for those operators willing to leave farming. Employment opportunities, and assistance for education enabling farm youth to compare the opportunities provided by farming with those of nonfarm employment and to compete favourably in the nonfarm job market needs to be developed.

Financing

Financial innovations permitting the accumulation of enough capital for the development of efficient units, are required. At present an equity determined capital lending policy is used. A lending policy based on managerial ability and backed by farmer supervision and guidance is required in many cases. A revolving loan for current expenses is needed as well as long term loans for the acquisition of land, livestock, machinery, and buildings. The policy that much security is required for land loans should be lessened somewhat and the size of the loan should be based on the productive capacity of the land. High interest rates do not aid small farmers to consolidate land. Most small farmers are small because they are not given the same opportunities to expand as are larger farmers. Although many small farmers borrow capital, they can only borrow small amounts as indicated in this study. In many cases the farmer required additional capital for current operating expenses when the marginal productivity was extremely high, however, credit was not available. The farmer who planted only one-half his land because he did not have enough seed or the many farmers who do not use fertilizer because they cannot buy it, are examples. Credit could be extended by fertilizer companies, elevator companies and livestock dealers. Greater use of this type of credit would require government guarantees as support. (Many large farmers use this type of credit interest free). The ease of obtaining loans from finance companies and machinery dealers or Farm Improvement Loans to buy machinery and equipment, which have a very low marginal productivity in Bonnyville, emphasizes the need to develop lending plans based on marginal productivities rather than on the ease or difficulty of obtaining a particular loan.

Improvements in Marketing and Production Supply Facilities

Low-income agricultural regions effect the economic growth of urban communities. The lower purchasing power of the farmer is seen when towns' people charge higher prices for durable goods, making it more difficult for farmers to purchase the inputs as cheaply at home as in other regions. Co-operative buying and selling can play a large role in agricultural progress. Marketing improved by a more competitive economy would help low-income regions. This is reflected by more prosperous areas closer to the industrialized consumer where higher prices for particular products (and lower prices for inputs) are paid because of the proximity of local markets. These advantages in high-income agricultural regions result in higher value productivity even though physical productivity is no higher.

CHAPTER VI

SUMMARY AND CONCLUSIONS

The rate of economic growth in Bonnyville, measured by gross income per operator in constant dollars, has not improved relative to Red Deer growth. Bonnyville farmers are as far behind as they were 25 years ago. At that time Red Deer farmers had twice the average gross farm income per operator and although 25 years later both regions had doubled their gross output per operator, Red Deer farmers still maintained the same relative position over Bonnyville farmers.

One reason why Bonnyville farmers have not overcome the differential income gap is the change in total regional output over time. Over the last 25 years, Red Deer increased her total regional output by 50 percent, whereas Bonnyville only made a 21 percent increase. As a result of low regional productivity, rapid off farm migration occurred and some 800 (40 percent) farm operators left the Bonnyville area between 1941 and 1961. The net farm income of the remaining farmers is still considerably below that of the provincial average.

The economic growth that did occur could be attributed to three major agricultural adjustments. There was a significant increase in all aspects of farm size in the Bonnyville area. Total farm acreage increased so that presently it is similar to Red Deer farms. More significant was the increased acreage in Bonnyville farms from 64 cultivated acres in 1936 to 220 cultivated acres in 1961. In Red Deer the change was from 160 acres to 276 acres.

Change in livestock production paralleled the change in gross income in both regions over time. Red Deer farmers on the average had twice as many cattle and hogs per farm as did Bonnyville some 2 or 3 decades ago and the same relative difference exists today.

Total capital investment per farm also relates to the trend in gross farm income. Total capital investment in both regions had increased ten fold in current dollars since 1936, Red Deer farms maintained about twice the average capital investment per farm as Bonnyville farmers. However, the distribution of capital investment among resources which was similar at one time, has changed. Today, Red Deer farms have considerably more invested in land and buildings whereas Bonnyville farms have increased investment in machinery and livestock. The distribution of farms by size of investment is markedly different in the two areas also. One half of the Bonnyville farms have a total investment below $25,000 whereas only 10 percent of the Red Deer farms are in this category.

Failure to gain capital to combine with existing labor, appears to be another cause of differing gross farm incomes in the two regions. Larger amounts of working and operating capital would help achieve the general economic objectives of the region. In the Bonnyville area over one half of the farmers said that they did not have sufficient capital in contrast to one quarter of the Red Deer farmers. Moreover the average loan in Red Deer was nearly twice as large as that in Bonnyville which reported 7 percent more loans.

Although there were more people per farm operator in Bonnyville, there was a larger labor force in man-years of available labor on Red Deer farms. Even though there was more labor in Red Deer, the labor was more

efficiently employed in terms of output per man-year than in Bonnyville. In other words there was more underemployed labor in Bonnyville than on Red Deer farms. However, quality of labor is probably much more important as far as farm production is concerned. In comparing managerial ability in the regions, Red Deer farm operators were far ahead of Bonnyville operators. Management was no doubt a factor relating to the size and determining the productivity of the farm.

Net farm income and family earnings were closely related to the quantity and quality of available resources per operator. As a result, the majority of the Bonnyville farms earned low net incomes, 67 percent earning less than $2,000 as compared with only 25 percent of the Red Deer farms. In their own value terms, 85 percent of the Bonnyville farmers and 40 percent of the Red Deer farmers stated that their incomes were unsatisfactory. The average net farm income was $1,325 in Bonnyville and $4,599 in Red Deer. The Bonnyville farmers gained 41 percent of their family farm income from non-farm sources as compared to 19 percent in Red Deer. Off-farm income did help to alleviate the low farm income problem for some of the farmers. While large differences in incomes may be attributed to inadequacy of farm capital per unit of labor, intensity of land use, and managerial ability, other differences in weather and farm size were undoubtedly important.

In spite of adjustments made to increase the efficiency of farm commodity production and labor migration, agricultural incomes remained relatively low. Most of the farmers in Bonnyville own too few resources which can be combined with labor to earn satisfactory incomes. It was found that not only do Bonnyville farmers lack sufficient resources but that available resources were not being employed efficiently.

By increasing the scale of farm, Bonnyville farmers could expect farm returns to increase by a factor of 1.6, whereas Red Deer farmers had constant returns to scale. In addition to increasing the size of farm, Bonnyville farmers would benefit if resources were used in different ratios. Increasing livestock production, land acres, coarse grain and forage, while decreasing wheat acreage and summer fallow would increase income considerably. However, to make these changes necessitates a larger amount of capital, more off-farm migration, more land consolidation and more and better management. It is obvious that external help from other institutions is necessary to facilitate these changes.

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APPENDIX I

SUPPORTING STATISTICAL DATA

TABLE I

BONNYVILLE RAINFALL, 1959-1966

Month	1959	1960	1961	1962	1963	1964	1965	1966	Average
					inches				
April	0.28	0.75	0.81	0.51	1.25	1.81	0.47	1.75	0.95
May	0.36	2.65	0.44	1.84	0.56	1.87	4.91	1.48	1.76
June	4.04	5.41	3.99	7.31	3.01	0.52	3.07	0.89	3.53
July	1.80	3.28	3.45	4.89	2.18	3.69	1.83	2.64	2.99
August	6.82	3.00	0.32	1.38	0.02	3.06	3.68	4.75	2.88
Total	13.30	15.09	9.01	15.92	7.02	10.95	13.96	11.51	12.10

Source: United Grain Grower Elevator Agent, Bonnyville, Alberta

TABLE II

TOTAL PRECIPITATION AND CROP SEASON RAINFALL, BONNYVILLE AND RED DEER

	Bonnyville Area					Red Deer Area			
Month	a Bonny-ville	b Cold Lake	c Elk-Point	d Lac La Biche	Average	d Pen-hold	d Red Deer	d Rocky Mountain House	Average
April	0.95	0.39	0.38	0.31	.51	0.46	0.61	0.36	0.48
May	1.76	1.25	1.26	1.20	1.73	1.73	2.67	1.90	2.10
June	3.53	3.29	2.91	2.64	3.09	3.28	3.72	3.69	3.56
July	2.97	3.49	2.77	2.83	3.01	2.81	3.26	3.32	3.13
August	2.88	3.14	2.41	2.74	2.79	2.49	3.67	2.95	3.04
Total	12.10	11.56	9.73	9.72	10.77	10.77	13.93	12.22	12.31
Yearly total rainfall	-	13.81	11.89	12.01	12.57	12.56	16.52	14.51	14.53
Yearly total precipitation	-	19.62	16.32	17.83	17.92	17.30	21.44	21.20	19.98

Source: a) United Grain Growers, Bonnyville, Alberta, 1959-1966, 8 years ending 1966
b) Climatalogy Division, Meterological Branch, Ontario, 10 years ending 1960
c) Same as b but for 30 years observation ending 1960
d) Same as b but for 10 to 24 years observation, 1931-1960.

TABLE III

GROSS SALES AND NET INCOME
1936, 42, 61 and 64 PER FARM

	1936	%	1942	%	1961	%	1964	%
Bonnyville M.D.								
Field crops	121[a]	30	271	21	851	27	674	19
Livestock	111	27	737	56	1,532	50	1,945	55
Livestock products	32	8	183	14	410	13	591	16
Other revenue	140	35	110	9	300[b]	10	345	10
Gross sales	404	100	1,300	100	3,093	100	3,565	100
Income in kind	260	-	355	-	500	-	541	-
Gross income	664	-	1,655	-	3,593	-	4,106	-
Expenses	214	-	608	-	-	-	2,781	-
Net farm income	450	-	1,047	-	-	-	1,323	-
Western Red Deer Gross Sales 1936-1942-1961 and 1964 Per Farm								
Field crops	531[a]	48	-	-	1,521	23	3,877	35
Livestock	321	29	-	-	3,817	58	5,263	48
Livestock products	104	10	-	-	677	10	1,238	11
Other revenue	143	13	-	-	610[b]	9	709	6
Total farm income	1,099	100	3,581	100	6,625	100	11,087	100
Income in kind	300	-	450	-	560	-	610	-
Gross income	1,399	-	4,031	-	7,185	-	11,697	-
Expenses	520	-	2,361	-	-	-	7,098	-
Net farm income	819	-	1,770	-	-	-	4,599	-

Source: Agriculture Census of Canada

[a]1936 field crops included crops to be sold giving a larger sale value to crop than actual.

[b]Estimated other revenue in 1961 includes supplementory payment, custom work, PFA, dividends etc.

TABLE IV

CHANGE IN NUMBER AND IN SIZE OF FARM IN BONNYVILLE M.D.
AND WESTERN RED DEER COUNTY FOR 1921 - 1961

Year	Total (acres)	Improved (acres)	Crops (acres)	Farms (No.)	Total (acres)	Improved (acres)	Crops (acres)	Farms (No.)
	Bonnyville M.D.				Western Red Deer County			
1921	203	35	27	651	305	106	89	921
1926	232	58	45	731	290	126	108	1,081
1931	230	60	47	1,329	285	152	114	1,230
1936	228	64	48	1,723	286	160	119	1,292
1941	244	86	58	1,814	287	179	119	1,329
1946	275	112	76	1,489	301	194	131	1,191
1951	313	141	104	1,501	316	218	158	1,194
1956	350	172	114	1,246	-	-	-	-
1961	401	220	142	1,035	383	276	199	1,021
Percent Change 1921-1961	+97	+530	+426	+59	+26	+160	+124	+11

Above Data for Bonnyville as a Percentage of Red Deer

Year	Total acres	Improved acres	Crops acres	Farms number
	- Percent -			
1921	69	33	30	71
1926	80	46	42	68
1931	81	39	42	108
1936	80	40	40	133
1941	85	48	49	130
1946	91	58	58	125
1951	99	65	66	126
1956	-	-	-	-
1961	105	80	71	101

TABLE V

PERCENTAGE DISTRIBUTION OF FARM SIZE IN BONNYVILLE M.D. AND WESTERN RED DEER COUNTY, 1921 TO 1961

Year	- acres - 1 - 100	101- 200	201- 300	301- 479	480 and over
			- percent -		
			Bonnyville M.D.		
1921	1.3	79.1	2.6	13.0	4.0
1936	2.7	65.2	3.0	22.2	6.9
1941	2.3	59.0	4.3	26.3	8.1
1946	2.4	47.4	5.0	33.6	11.6
			Western Red Deer County		
1921	3.4	45.0	4.3	31.0	16.3
1936	4.5	47.3	3.4	28.2	16.6
1941	8.8	41.6	4.3	29.0	16.3
1946	6.1	39.5	5.1	31.9	17.4

Year	- acres - 1- 69	70- 239	240- 399	400- 559	560- 759	760 and over
			Bonnyville M.D.			
1951	1.6	38.6	36.0	15.0	5.3	3.5
1956	3.4	28.7	35.0	19.2	8.5	5.2
1961	2.5	21.4	24.2	21.7	11.6	8.6
			Western Red Deer County			
1951	7.4	25.8	32.3	12.2	7.0	5.3
1961	7.6	27.2	31.0	15.2	9.4	9.6

Approximate Overall Change Above by Quarter Section

Year	- Quarter Sections - One	Two	Three	Four
		- percent -		
		Bonnyville		
1921	79	13	3	1
1961	21	24	22	12
		Red Deer		
1921	45	31	8	5
1961	27	31	15	9

Source: Agriculture Census of Canada

TABLE VI

RATE OF INCREASE IN FARM SIZE FOR ALL FARM OPERATORS IN 1965 IN BONNYVILLE M.D. AND WESTERN RED DEER FOR 1951, 1961 AND 1965

	Bonnyville M.D. - year -			Western Red Deer - year -		
	1951	1961	1965	1951	1961	1965
1965 operators in year above	502	666	742	595	717	791
1965 operators not in year above	240[a]	76	0	196	74	0
(percent)	32.3	10.2	-	24.8	9.4	-
Average size (acres)[b]	332	394	454	325	413	467
Percent increase	18.7	15.2		27.1	13.1	
Overall percent increase	36.7			43.7		

Source: 1965 Survey

[a]"240" is the number of operators who were not farming in 1951 but were farming in 1965.

[b]Average size of farm for those 1965 operators only who were farming in 1951 and 1961.

TABLE VII

FARM LAND USE IN THE BONNYVILLE M.D. AND WESTERN RED DEER COUNTY, 1921-1961

Census Year	Average Acreage Per Farm: Field Crops	Hay & Fodder	Improved Pasture	Fallow	Total Improved	Total un-improved	Total Farm
			Bonnyville M.D.				
1921	26	2	1	5	35	168	203
1926	43	2	1	11	58	174	232
1931	44	3	1	11	60	170	230
1936	45	3	1	12	64	164	228
1941	54	4	3	23	87	158	244
1946	66	11	4	27	112	163	275
1951	88	16	6	26	141	172	313
1956	100	14	10	42	172	178	350
1961	112	30	16	55	220	181	401
			Western Red Deer County				
1921	72	18	1	15	106	199	305
1926	98	10	3	22	126	164	290
1931	101	13	7	27	152	133	285
1936	103	16	8	31	160	126	286
1941	106	14	10	45	180	108	287
1946	115	16	14	43	194	107	301
1951	136	21	14	40	218	98	316
1956							
1961	146	53	26	41	276	107	383

Source: Agriculture Census of Canada

TABLE VIII

DISTRIBUTION OF IMPROVED AND UNIMPROVED LAND IN BONNYVILLE M.D. AND WESTERN RED DEER COUNTY, 1921-1965

Year	Improved				Unimproved		
	% of total	% field crops	% fallow	% pasture	% of total	% woodland	% native pasture and waste
				Bonnyville M.D.			
1921	17	78	15	3	83	56	44
1926	25	78	18	1	75	55	45
1931	26	77	18	2	74	65	35
1936	28	75	19	2	72	60	40
1941	35	67	26	3	65	41	59
1946	41	69	24	3	59	32	68
1951	45	74	19	4	55	32	68
1956	49	66	24	6	51	20	80
1961	55	65	25	7	45	33	67
1965	63	61	19	16	37	67	33
Percent Change 1921-26 to 1961-65	+180	-19	+33	+475	-48	-10	+12
				Western Red Deer County			
1921	35	84	14	1	65	44	56
1926	47	80	16	2	53	32	68
1931	53	75	18	6	47	49	51
1936	56	75	20	5	44	42	58
1941	63	67	25	6	38	30	70
1946	64	68	22	7	36	29	71
1951	69	72	18	6	31	30	70
1956	-	-	-	-	-	-	-
1961	72	72	15	9	28	31	69
1965	77	78	10	9	23	47	53
p							
Percent Change 1921-26 to 1961-65	+82	-9	-17	+830	-57	+2	-2

Source: Agriculture Census of Canada

TABLE IX

DISTRIBUTION OF FIELD CROPS IN BONNYVILLE M.D. AND WESTERN RED DEER COUNTY, 1921-1961

Year	Wheat	Oats	Barley	Mixed Grain	Hay and Fodder
			- percent -		
			Bonnyville M.D.		
1921	28	61	3	x	6
1926	59	28	5	x	4
1931	59	28	7	x	6
1936	58	24	12	x	5
1941	37	32	23	x	7
1946	40	22	22	1	14
1951	34	19	30	2	16
1956	29	19	35	4	13
1961	33	20	15	10	20
			Western Red Deer County		
1921	21	49	8	x	20
1926	46	35	9	x	10
1931	50	26	11	x	12
1936	46	20	20	x	13
1941	29	26	32	1	11
1946	19	20	48	1	12
1951	10	16	59	x	13
1956	7	16	50	2	24
1961	4	14	50	4	27

x = less than 1 percent

Source: Agriculture Census of Canada

TABLE X

DISTRIBUTION OF DIFFERENT TYPES OF CATTLE PER FARM IN BONNYVILLE M.D. AND WESTERN RED DEER COUNTY, 1965[1]

Item		Bonnyville	Red Deer
Cows and heifers one year and older	(number)	2,859	3,957
	(percent)	56.5	47.9
Bulls, one year and over	(number)	117	141
	(percent)	2.3	1.7
Steers one year and over	(number)	464	1,588
	(percent)	9.2	19.2
Calves under one year	(number)	1,623	2,578
	(percent)	32.0	31.2
Total Cattle	(number)	5,063	8,264
	(percent)	100.0	100.0

Source: 1965 Sample Survey

[1]Sample survey of 146 farms in Red Deer and 144 farms in Bonnyville.

TABLE XI

NUMBER OF CATTLE AND PIGS PER FARM AND PER ACRE IN BONNYVILLE M.D. AND WESTERN RED DEER COUNTY, 1931-1965

Year	Cattle per farm	Pigs per farm	Cattle per 100 acres	Pigs per 100 cultivated acres	Cattle per farm	Pigs per farm	Cattle per 100 acres	Pigs per 100 cultivated acres
	Bonnyville				Red Deer			
1931	6.5	8.2	2.82	13.5	12.4	16.7	4.34	11.0
1936	8.7	6.7	3.81	10.5	19.7	14.0	6.88	8.8
1941	7.8	15.9	3.18	18.4	15.1	30.8	5.26	17.2
1946	11.3	11.4	4.11	10.2	19.2	17.4	6.38	9.0
1951	10.2	13.9	3.27	09.9	17.7	18.1	5.61	8.3
1956	26.6	32.5	4.53	18.9	35.9	22.1	9.17	9.5
1961	22.8	30.2	5.67	13.7	46.0	28.9	10.90	10.5
1965	37.5	28.4	8.93	10.7	63.6	45.2	13.76	12.8

Bonnyville as a Percentage of Red Deer[a]

Year	Cattle/ farm	Pigs/ farm	Cattle/ acre	Pigs/ cultivated acre
	- percent -			
1931	52	49	65	123
1936	44	48	55	120
1941	52	52	60	107
1946	59	65	64	114
1951	58	77	58	119
1956	74	147	49	199
1961	50	104	52	130
1965	59	68	65	84

[a] $\frac{\text{Bonnyville}}{\text{Red Deer}}$ x 100 = Percent ratio.

Source: Agriculture Census of Canada, 1931-65
Figures for 1965 from 1965 sample survey.

TABLE XII

INVESTMENT IN MACHINERY, SELECTED FARMS IN THE PRAIRIE PROVINCES, 1960-64

	Size of Farm			All Groups
	Small	Medium	Large	
	- acres per farm -			
Improved acres	217	517	1,020	518
Total farm capital	$25,659	$15,168	$67,465	$46,039
Machinery and Equipment	$5,566	$11,504	$16,860	$10,615
(percent of total)	21.7	22.5	25.0	23.1
Investment of M. & E. per improved acre	$25.60	$22.30	$16.50	$20.50
In new machinery and equipment used per improved acre	$76.00	$54.00	$37.00	$55.70
Ratio of Inventory Value to replacement cost (percent)[a]	33	41	45	37

Source: Table 1 of "Farm Machinery Syndicates in the Prairie Provinces," Canadian Farm Economics, Economics Branch, Canadian Department of Agriculture, 1966. Data is based on 13 reports of the "Changes in Farm Organization Study" of the Economics Branch, Canadian Department of Agriculture, Edmonton, Saskatoon, and Winnipeg, 1960-64.

TABLE XIII

DISTRIBUTION OF FARM OPERATORS BY AGE, BONNYVILLE M.D. AND WESTERN RED DEER COUNTY, 1961

Age of Operator	Bonnyville	Red Deer
(Years)	(Number)	(Number)
Under 25	37	20
25 - 34	167	130
35 - 44	244	226
45 - 54	239	275
55 - 59	120	145
60 - 64	77	102
65 - 69	30	63
70 and over	27	60

Source: 1961 Census of Canada (Unpublished material)

TABLE XIV

METHOD USED IN CALCULATING MAN-YEARS OF FAMILY LABOR

Age	Sex	Characteristics	Score in man years
less than 50	M	Operator or partner	1.00
50 - 59	M	Operator or partner	0.85
60 and over	M	Operator or partner	0.75
15 and over	M	Boy attends school	0.35
15 and over	M	Boy does not attend school	0.90
Regardless	F	Wife of operator or of hired man	0.50
15 and over	F	Girl attends school	0.20
15 and over	F	Girl does not attend school	0.40

The number of days worked off the farm was subtracted as in example:

School teacher works 5 days per week for 43 weeks or 215 days. There are about 300 working days in a farm year excluding Sundays and holidays so

$\frac{215}{300}$ = 0.72 man year off the farm leaving 0.28 man years of work on the farm.

TABLE XV

AVERAGE INVESTMENT PER FARM SIZE, BY MAJOR CATEGORIES, BONNYVILLE M.D. AND WESTERN RED DEER COUNTY, 1965

Size of Farm	Land Bldg.		Machinery Equipment		Livestock & Poultry		Total
acres	$	%	$	%	$	%	$
			Bonnyville M.D.				
Under 239	9,119	59	4,342	28	1,936	13	15,397
240 - 399	14,884	62	5,709	24	3,410	14	24,003
400 - 559	16,654	56	8,118	28	4,750	16	29,522
560 - 759	22,250	60	8,738	23	6,266	17	37,254
760 and over	22,500	50	10,796	24	11,637	26	44,933
			Western Red Deer County				
Under 239	21,832	71	4,832	16	3,691	13	29,555
240 - 399	39,421	72	8,719	16	6,715	12	54,855
400 - 559	52,127	71	13,353	18	8,053	11	73,533
560 - 759	77,964	72	18,976	18	11,363	11	108,303
760 and over	102,993	70	28,817	20	14,449	10	146,259

TABLE XVI

MEAN DEBT AND EQUITY FOR OPERATORS IN VARIOUS AGE GROUPS FOR BONNYVILLE M.D. AND WESTERN RED DEER COUNTY, 1965

Age Group	No. of Farms	Mean Net Worth	Mean Investment	Mean Debt	Percent Equity
			Bonnyville (owners with debt)		
20 - 29	10	$17,420	$27,020	$ 9,600	64
30 - 39	32	19,090	24,719	5,629	77
40 - 49	33	25,783	31,900	6,116	81
50 - 59	18	23,078	25,554	2,476	90
60 +	4	13,741	18,287	4,546	72
Total	97				
			Western Red Deer (owners with debt)		
20 - 29	1	$32,320	$34,820	$ 2,500	93
30 - 39	15	56,232	67,961	11,729	83
40 - 49	18	70,650	79,607	8,956	89
50 - 59	15	51,191	55,121	3,930	93
60 +	13	41,218	43,483	2,264	95
Total	62				
			Bonnyville (all farms with debt)		
20 - 29	13	$16,765[a]	$26,989[b]	$ 8,157	62
30 - 39	38	17,373	24,697	5,641	70
40 - 49	35	23,928	32,334	6,200	74
50 - 59	20	23,117	26,123	2,458	89
60 +	5	17,026	23,052	3,877	74
Total	111				
			Western Red Deer (all farms with debt)		
20 - 29	5	$45,432	$78,627	$10,080	58
30 - 39	22	56,794	76,709	12,851	74
40 - 49	30	66,795	87,445	12,302	76
50 - 59	26	62,736	77,763	5,106	81
60 +	22	59,328	68,435	3,363	87
Total	105				

[a]The mean net worth was estimated by subtracting estimate value of rented land.

[b]Mean investment includes value of rented land.

TABLE XVII

DISTRIBUTION OF LOANS BORROWED AND OUTSTANDING BY PURPOSE OF LOAN, BONNYVILLE M.D. AND WESTERN RED DEER COUNTY, 1965

Purpose of Loan	Number of Loans	Mean Amount Borrowed	Total Amount Borrowed	Total Amount Outstanding
		Bonnyville M.D.		
Land	74	$5,386	398.5	334.8
Percent	26		56	54
Building	14	2,049	28.7	22.4
Percent	5		4	4
Machinery	74	2,795	165.1	148.1
Percent	26		23	24
Farm Operation	62	1,053	65.3	61.7
Percent	22		9	10
Personal	26	1,132	29.4	24.6
Percent	9		4	4
Other	35	786	27.5	22.2
Percent	12		4	4
Total	285		714.5	613.9 (85.9%)
		Western Red Deer County[a]		
Land	65	$12,612	819.8	647.5
Percent	24		55	57
Building	29	3,446	99.9	60.7
Percent	11		7	5
Machinery	78	4,478	349.3	260.0
Percent	29		23	23
Farm Operation	49	2,937	143.9	112.3
Percent	18		10	10
Personal	27	1,704	46.0	40.1
Percent	10		3	3
Other	19	1,426	27.0	18.9
Percent	7		2	2
Total	267		1,486.1	1,139.4 (76.5%)

[a]Sample size for Red Deer was 145 instead of normal 136 farms whereas Bonnyville was 136 farms as usual.

TABLE XVIII

COMPOSITION OF FAMILY LABOR, BONNYVILLE M.D., AND WESTERN RED DEER COUNTY, 1965

	Number	Man Years	Number	Man Years
	Bonnyville		Red Deer	
Men operators	136	136.0	136	136.0
less age factor		-6.6		-12.9
less off-farm work	46	-25.2	28	-17.2
Total available		104.2		105.9
Women (wives)	119	59.5	116	58.0
less off-farm work	15	-4.4	9	-3.3
Total available		55.1		54.7
Sons (over 15 years)[a]	24	12.0	39	29.1
other men	0[b]	-	13	13.0
Daughters (over 15 years)	27	5.4	16	5.0
Total available		17.4		47.1
Total available		176.7		207.7
per farm		1.29		1.52

[a]Sons and daughters who work off the farm and stay at home are not included here.

[b]There were other men on the farms but these were the farms that were rejected as mentioned in Chapter I.

TABLE XIX

DISTRIBUTION OF FARM FAMILY CHARACTERISTICS, BONNYVILLE M.D. AND WESTERN RED DEER COUNTY, 1965

	Per Farm Number	On Farms Percent	Per Farm Number	On Farms Percent
	Bonnyville		Red Deer	
Children born per farm	3.97	100	3.04	100
Children under 24 on farm	2.46	62	1.67	54
Parents and bachelors	1.85		1.86	
Average size presently residing	4.31		3.53	
Children distribution by:				
Age				
Under 5 years		26		22
5 - 14		58		51
15 - 23		16		27
Sex				
Male		55		54
Female		45		46
Schooling				
Preschool		32		23
At school		67		60
Other		1		17

Schooling of Operator and Spouse

Years of School	Bonnyville % Operators	Bonnyville % Spouses	Red Deer % Operators	Red Deer % Spouses
Under 5	17	9	4	0
5 - 6	14	11	6	7
7 - 8	41	35	45	46
9 - 10	23	28	28	26
11 - 12	5	17	16	19
Over 12	0	0	1	2
Minimum	0	2	4	5
Maximum	12	12	16	18
Mean	7	8.2	8.6	8.5

TABLE XX

DISTRIBUTION OF FAMILY LABOR USE BY SIZE OF FARM, BONNYVILLE M.D. AND WESTERN RED DEER COUNTY, 1965

Size of Farm (acres)	Bonnyville M.D. Number farms	Total PMWU[a]	Man Years	PMWU per MY[b]	Western Red Deer County Number farms	Total PMWU	Man Years	PMWU per MY
Under 239	21	132	1.03	128	26	192	1.07	179
240 - 399	50	246	1.30	189	43	302	1.48	204
400 - 559	39	326	1.27	256	27	361	1.37	263
560 - 759	18	404	1.46	276	18	508	1.86	273
760 and over	8	550	1.40	393	22	699	2.08	336

[a]PMWU is a measure of the amount of work to be done on a farm. One unit represents the average amount of directly productive work accomplished by one man, under average conditions, in a ten hour day. It is a measure of productive work only and does not involve work that is not productive such as mending fences or repairing machinery. The production of one beef cow or planting of small grains all have been assigned standard units by the provincial "Extension Service," Alberta, Department of Agriculture, Feb. 1960, FMDB 109 - 50, and these figures were used.

[b]MY means man years and this column is a measure of labor efficiency in agriculture.

TABLE XXI

SOIL AND FEED RECOMMENDATIONS, BONNYVILLE M.D. AND RED DEER COUNTY, RECENT YEARS

Bonnyville		Red Deer	
	Number of Recommendations		
Year	Soil and Feed	Year	Soil and Feed
1951	Nil	1951	N/A
1956	1	1958	31
1961	5	1961	57
1964	9	1964	84
1965	47	1965	90

Source: District Agriculturists at Bonnyville and Red Deer.

TABLE XXII

FERTILIZER AND CHEMICAL USE - BONNYVILLE M.D. & RED DEER COUNTY

Fertilizer Use

Year	Bonnyville M.D. Fertilizer tons	Farms reporting percent	Used on cereals percent	Used on forage percent	Red Deer County No. 55 Fertilizer tons	Farms reporting percent	Used on cereals percent	Used on forage percent
1962	775	20	70	30	6,100	35	92	7
1963	1,153	30	70	30	7,400	35	92	7
1964	1,268	30[a]	70	30	8,880	45[b]	92	7
1965	1,350	40	70	30	9,590	65	88	11
1966	1,500	50	75	25	15,000	70	85	10
1964 (Survey 1965)		40				75		

Chemicals Use

Year	2-4-D and MCP	Acres of crop and rented	2-4-D and MCP	Acres of crop treated
	lb	percent	lb	percent
1959	7,200	15	39,000	28
1960	8,700	30	37,000	28
1961	13,800	39	36,000	18
1962	10,100	23	58,000	40
1963	15,700	38	78,000	43
1964	8,200[c]	18	93,000	52
1965	14,700	35	86,000	52

Source: Provincial Department of Agriculture

[a]The 1964 Bonnyville estimate of 30 percent should be 40 percent as indicated by the 1965 sample survey.

[b]The Red Deer estimate of 45 percent of the farms reported using fertilizer should have been around 75 percent, that is nearly 30 percent more. The figures for 1965 and 1966 are probably underestimated also to a large degree.

[c]Chemical use depends largely on the weather and if crops are poor or if soil conditions are too wet, then the amount of chemical used will be less. As 1964 was extremely dry in June, many farmers retained from spraying their crops.

TABLE XXIII

DISTRIBUTION OF GROSS SALES, EXPENSES, AND INCOME BY SIZE OF FARM, BONNYVILLE M.D. AND WESTERN RED DEER COUNTY, 1965

Average farm size (acres)	Gross farm sales	Total farm Expenses	Net farm income	Expenses/ sales
		Bonnyville M.D.		
157	2,015	1,297	718	0.644
315	3,357	2,199	1,158	0.655
472	4,973	3,406	1,567	0.685
648	5,575	3,825	1,750	0.688
996	6,704	4,686	2,018	0.699
Average				
420	4,106	2,781	1,325	0.679
		Western Red Deer County		
165	5,158	2,978	2,180	0.577
312	8,260	4,840	3,420	0.587
475	10,900	6,910	3,980	0.634
633	17,960	10,660	7,300	0.594
954	21,990	13,735	8,255	0.625
Average				
462	11,697	7,098	4,599	0.608

TABLE XXIV

AVERAGE DISTRIBUTION OF LIVESTOCK PER FARM BY SIZE OF FARM, BONNYVILLE M.D. AND WESTERN RED DEER, 1965

Farm size (acres)	Calves	Steers	Heifers	Cows		Total	Hogs	Sheep	Total Livestock in PMWU
				Beef	Milk				
Bonnyville M.D.									
Under 249	5.4	1.1	1.4	2.1	4.6	15.1	8.6	1.0	75
240 - 399	9.0	1.9	3.3	4.6	7.1	26.5	18.3	0.3	140
400 - 559	9.9	3.0	4.3	7.8	6.7	32.5	43.7	9.5	180
560 - 759	15.8	2.2	5.0	14.2	6.8	45.0	46.9	0.2	208
760 and over	28.3	8.3	10.8	29.9	5.6	84.3	28.9	0.4	263
Western Red Deer County									
Under 249	5.4	2.0	2.8	2.2	6.3	19.0	29.9	-	129
240 - 399	15.9	3.7	4.2	14.3	4.5	43.4	46.8	0.3	180
400 - 559	16.4	7.7	8.2	15.4	4.2	52.7	39.7	-	190
560 - 759	25.5	10.0	7.1	21.6	6.9	71.8	33.4	-	248
760 and over	27.8	17.2	10.1	25.1	7.7	88.9	76.5	1.3	337

TABLE XXV

DISTRIBUTION OF NET INCOME, NET INCOME PER MANYEAR, RETURNS TO INVESTMENT AND LABOR, BY VARIOUS SIZE OF FARMS, BONNYVILLE M.D. AND WESTERN RED DEER, 1965

Average farm size (acres)	Net income (dollars)	Net income per unit of labor (dollars)	Returns per unit labor less 5% for investment (dollars)	Returns to net investment after allowing $2,000 for each manyear of labor[a] (percent)
		Bonnyville M.D.		
157	718	697	23	less than zero[b]
315	1,158	891	86	"
472	1,567	1,234	294	"
648	1,750	1,199	174	"
996	2,018	1,517	225	"
Average				
420	1,325	1,035	170	"
		Western Red Deer County		
165	2,180	2,037	727	0.1
312	3,420	2,311	921	0.9
475	3,980	2,905	418	1.8
633	7,300	3,925	1,355	3.8
954	8,255	3,969	779	3.1
Average				
462	4,599	3,025	819	2.3[c]

[a]Net investment is total investment less debt but it includes rented real estate.

[b]A negative return to investment is meaningless.

[c]If rented real estate is subtracted from investment the average return to investment after labor is 2.5 percent and not 2.3 per cent.

Typed by

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